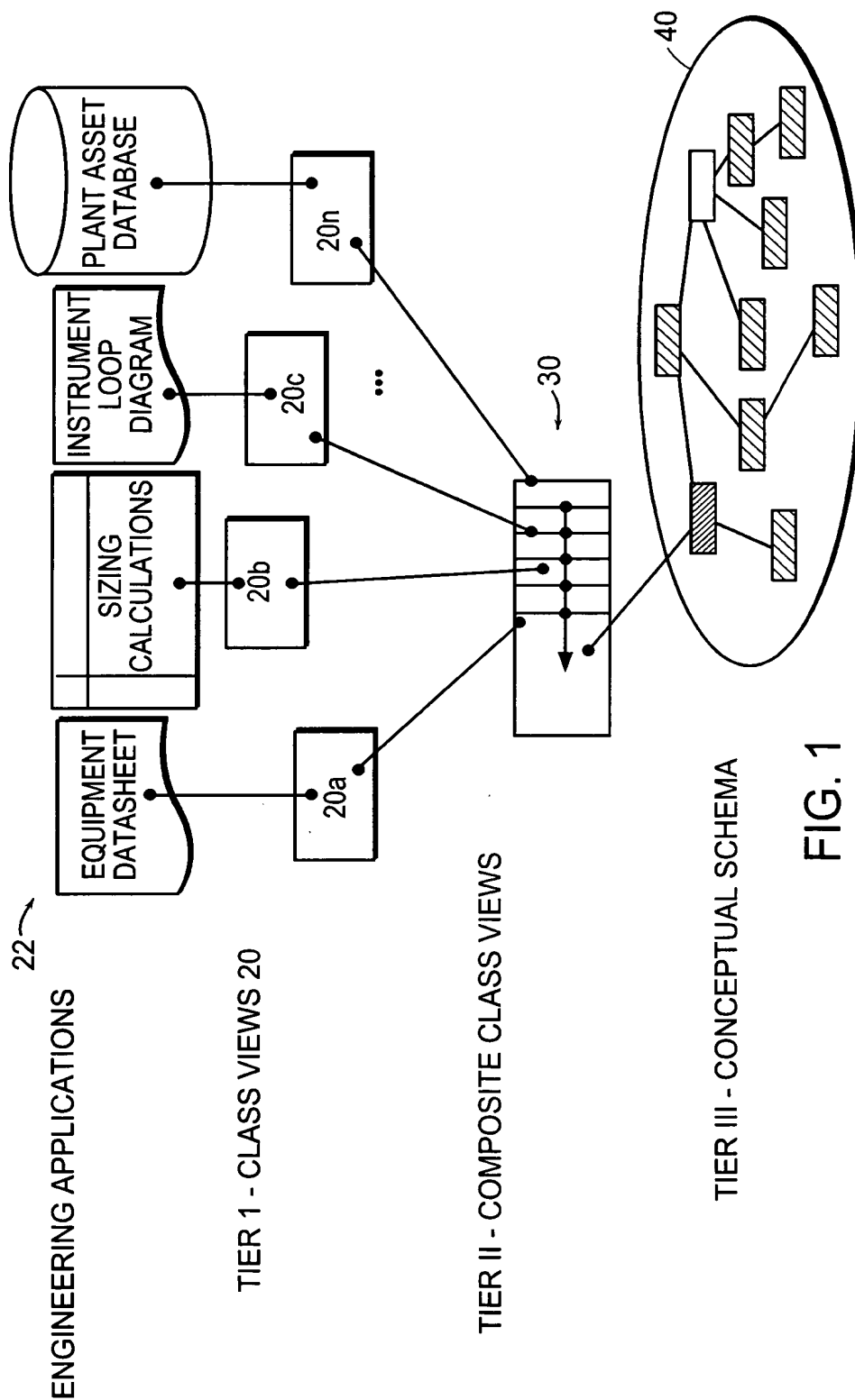




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INTERFACING ENGINEERING APPLICATIONS TO THE
THREE-TIER DATA MODEL ARCHITECTURE



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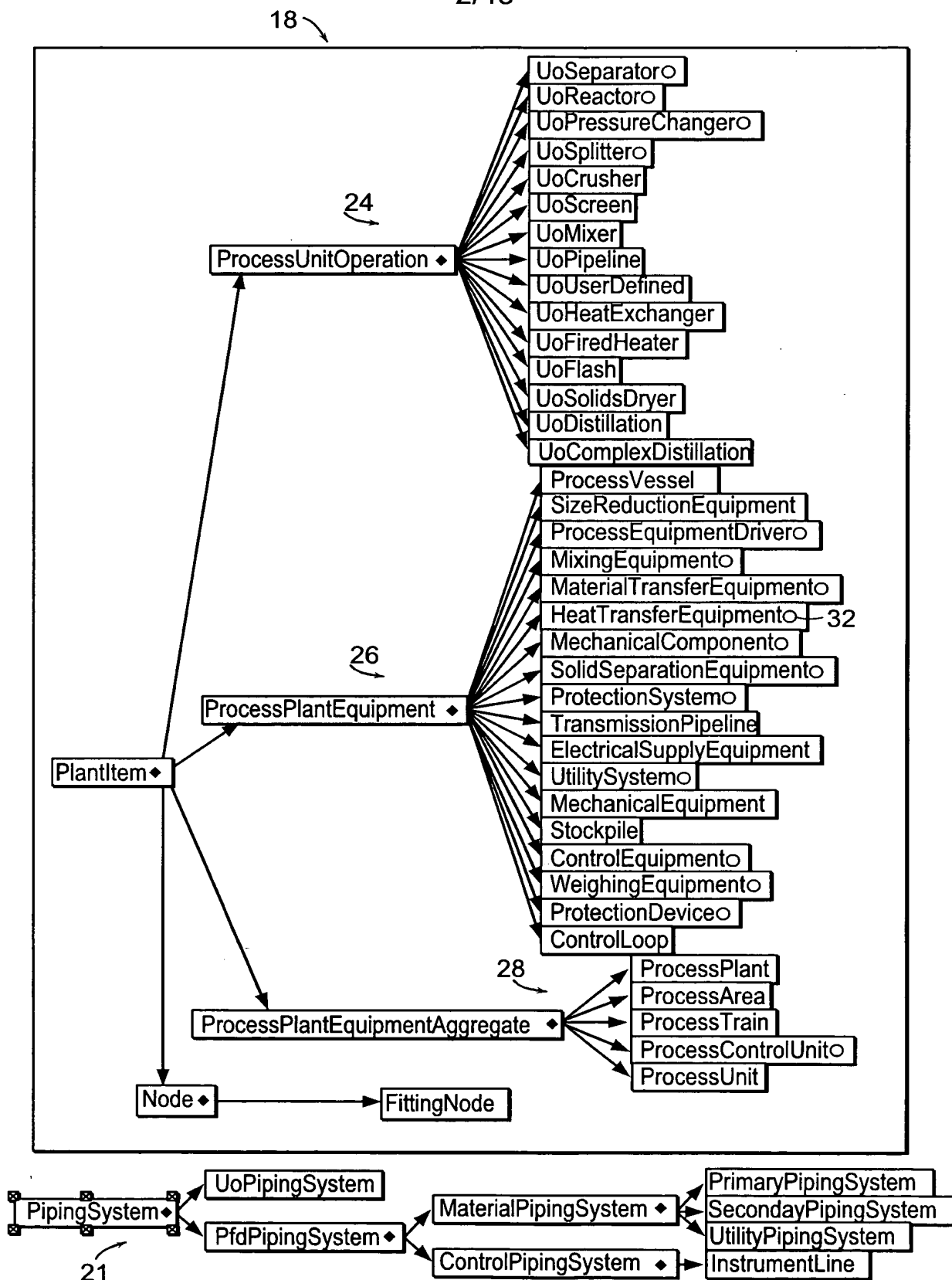


FIG. 2

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FIG. 3A
FIG. 3B
FIG. 3C
FIG. 3D
FIG. 3E
FIG. 3F
FIG. 3G
FIG. 3H
FIG. 3I
FIG. 3J

FIG. 3

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32	<input checked="" type="checkbox"/> NozzleNeckMaterial	ConstructionMaterial	ExchangerShell
	<input checked="" type="checkbox"/> NozzleReinforcementMaterial	ConstructionMaterial	ExchangerShell
	<input checked="" type="checkbox"/> PipeAndStubEndMaterial	ConstructionMaterial	ExchangerShell
	CoverType	eShellCoverType(ExchangerShell)	ExchangerShell
	<input checked="" type="checkbox"/> CoverMaterial	ConstructionMaterial	ExchangerShell
	TemaShellType	eShellTEMAType	ExchangerShell
	InnerDiameter	Real	ExchangerShell
	OrientationAngle	Real	ExchangerShell
	OuterDiameter	Real	ExchangerShell
	RearSupportPlateType	String	ExchangerShell
	Thickness	Real	ExchangerShell
	VerticalHeight	Real	ExchangerShell
	EffectiveArea	Real	ExchangerShell
	TotalArea	Real	ExchangerShell
	AverageMetalTemperature	Real	ExchangerShell
	<input checked="" type="checkbox"/> Velocities	ExchangerFluidVelocity	ExchangerShell
	ExpansionJointRequired	Boolean	ExchangerShell
	<input checked="" type="checkbox"/> ExpansionJoints	ExpansionJoint	ExchangerShell
	<input checked="" type="checkbox"/> FrontEndVapourBelt	VapourBelt	ExchangerShell
	<input checked="" type="checkbox"/> RearEndVapourBelt	VapourBelt	ExchangerShell
	KettleInnerDiameter	Real	ExchangerShell
	KettleInnerDiameter	Real	ExchangerShell
	KettlePortAngle	Real	ExchangerShell

FIG. 3B

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32		Real	Length normal	ExchangerShell
KettlePortLength		eKettleType(ExchangerShell)		ExchangerShell
KettleType		ConstructionMaterial		ExchangerShell
ChannelMaterial		ConstructionMaterial		ExchangerShell
ChannelCoverMaterial		ConstructionMaterial		ExchangerShell
FloatingHeadCoverMaterial		ConstructionMaterial		ExchangerShell
Lining		Gasket		ExchangerShell
Gasket		Boolean		ExchangerShell
InletAtChannelEnd		Integer		ExchangerShell
NumberCondensateNozzles		Integer		ExchangerShell
NumberInletNozzles		Integer		ExchangerShell
NumberIntermediateNozzles		Integer		ExchangerShell
NumberLiquidOnlyOutletNozzles		Integer		ExchangerShell
NumberOutletNozzles		Integer		ExchangerShell
NumberVapourOnlyOutletNozzles		Integer		ExchangerShell
InletNozzleLocation		eInletNozzleLocation(ExchangerShell)		ExchangerShell
MechanicalCleaning		String		ExchangerShell
EntranceConstruction		eEntranceConstruction(ExchangerShell)		ExchangerShell
ExitConstruction		eExitConstruction(ExchangerShell)		ExchangerShell
MassBalanceIn		UoPort		ExchangerShell
MassBalanceOut		UoPort		ExchangerShell
MaximumHydrogenPartialPressure		Real	Pressure abs	ExchangerSide
MaximumH2sPartialPressure		Real	Pressure abs	ExchangerSide
NumberOfPasses		Integer		ExchangerSide

FIG. 3C

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Remarks	String	MechanicalComponent
NamePrecedent	String	MechanicalComponent
ApplicableTo	eApplicableTo(ProcessPlantEquipment)	ProcessPlantEquipment
DefaultSymbol	String	ProcessPlantEquipment
ConstructionStatus	eConstructionStatus	ProcessPlantEquipment
NamePrecedent	String	ProcessPlantEquipment
MaterialPorts	MaterialPort	ProcessPlantEquipment
SignalPorts	SignalPort	ProcessPlantEquipment
EquipmentFunction	String	ProcessPlantEquipment
Manufacturer	String	ProcessPlantEquipment
PurchasedCapitalCost	Real	ProcessPlantEquipment
DeliveredCapitalCost	Real	ProcessPlantEquipment
InstalledCapitalCost	Real	ProcessPlantEquipment
NumberOfSpares	Integer	ProcessPlantEquipment
NumberInService	Integer	ProcessPlantEquipment
NumberRequired	Integer	ProcessPlantEquipment
PidNumber	String	ProcessPlantEquipment
Size	String	ProcessPlantEquipment
Function	String	ProcessPlantEquipment
OperatingFactor	String	ProcessPlantEquipment
Model	String	ProcessPlantEquipment
SerialNumber	String	ProcessPlantEquipment
ManufacturersSerialNumber	String	ProcessPlantEquipment

FIG. 3D

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32			
FabricationSerialNumber	String		ProcessPlantEquipment
OperationMode	eOperationMode(MechanicalEquipment)		ProcessPlantEquipment
MaterialSchedule	ConstructionMaterial		ProcessPlantEquipment
ShippingRequirements	ShippingRequirements		ProcessPlantEquipment
Location	Location		ProcessPlantEquipment
NoiseSpecification	NoiseSpecification		ProcessPlantEquipment
SpaceRequired	SpaceRequirement		ProcessPlantEquipment
InspectionAndTests	InspectionAndTests		ProcessPlantEquipment
DesignCodes	DesignCode		ProcessPlantEquipment
SpareParts	SpareParts		ProcessPlantEquipment
Weights	Weights		ProcessPlantEquipment
Represents	ProcessUnitOperation		ProcessPlantEquipment
NormalOperatingCriteria	OperatingCriteria		ProcessPlantEquipment
MaximumOperatingCriteria	OperatingCriteria		ProcessPlantEquipment
MinimumOperatingCriteria	OperatingCriteria		ProcessPlantEquipment
NormalContents	MaterialAmountSpecification		ProcessPlantEquipment
NormalContents	MaterialAmountSpecification		ProcessPlantEquipment
MinimumContents	MaterialAmountSpecification		ProcessPlantEquipment
MaximumContents	MaterialAmountSpecification		ProcessPlantEquipment
ManufacturerAddress1	String		ProcessPlantEquipment
ManufacturerAddress2	String		ProcessPlantEquipment
ManufacturerPhone	String		ProcessPlantEquipment
Fabricator	String		ProcessPlantEquipment
FabricatorAddress1	String		ProcessPlantEquipment

FIG. 3E

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FabricatorAddress2	String		ProcessPlantEquipment
FabricatorPhone	String		ProcessPlantEquipment
SuppliedBy	ePurchaserOrManufacturer		ProcessPlantEquipment
MountedBy	ePurchaserOrManufacturer		ProcessPlantEquipment
ModelNumber	String		ProcessPlantEquipment
ApplicableStandard	String		ProcessPlantEquipment
Orientation	String		ProcessPlantEquipment
⊕ Customer	ProcessPlantCorporation		ProcessPlantEquipment
JobNumber	String		ProcessPlantEquipment
PoNumber	String		ProcessPlantEquipment
PoDate	String		ProcessPlantEquipment
InquiryBy	String		ProcessPlantEquipment
InquiryNumber	String		ProcessPlantEquipment
SpecificationNumber	String		ProcessPlantEquipment
RequisitionNumber	String		ProcessPlantEquipment
SAPNumber	String		ProcessPlantEquipment
⊕ MaximumUtilities	SiteUtilityService		ProcessPlantEquipment
⊕ MinimumUtilities	SiteUtilityService		ProcessPlantEquipment
⊕ Utilities	SiteUtilityService		ProcessPlantEquipment
⊕ UtilitySummary	UtilitySummary		ProcessPlantEquipment

FIG. 3F

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32			
PaintSpecifications	PaintSpecifications		ProcessPlantEquipment
Mounting	Boolean		ProcessPlantEquipment
CostingReference	String		ProcessPlantEquipment
CostData	Cost		ProcessPlantEquipment
ControlEquipment	ControlEquipment		ProcessPlantEquipment
Documentation	Documentation		ProcessPlantEquipment
SupplierData	ProcessPlantCorporation		ProcessPlantEquipment
CustomerData	ProcessPlantCorporation		ProcessPlantEquipment
FabricatorData	ProcessPlantCorporation		ProcessPlantEquipment
ManufacturerData	ProcessPlantCorporation		ProcessPlantEquipment
Purchaser	ProcessPlantCorporation		ProcessPlantEquipment
Type	String		PlantItem
ItemNumber	String		PlantItem
ItemSequenceNumber	String		PlantItem
ItemSuffix	String		PlantItem
CompleteItemNumber	String		PlantItem
Comments	Comment		PlantItem
Notes	String		PlantItem
Description	String		PlantItem
NormalDesignCriteria	DesignCriteria		PlantItem
MinimumDesignCriteria	DesignCriteria		PlantItem
MaximumDesignCriteria	DesignCriteria		PlantItem
CaseName	String		PlantItem
MaterialConstruction	ConstructionMaterial		PlantItem

FIG. 3G

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<div>32</div> <div>Insulation</div> <div>Insulation</div> <div>Nozzles</div>		ConstructionMaterial	PlantItem
		ConstructionMaterial	PlantItem
		Nozzle	PlantItem
Entrance Type		eEntranceType(Nozzle)	Nozzle
NozzleFunction		eNozzleFunction(Nozzle)	Nozzle
NozzleMark		String	Nozzle
Number		Integer	Nozzle
NozzleType		eType(Nozzle)	Nozzle
NozzleOrientation		Real	Nozzle
FlangeAndGasketByVendor		Boolean	Nozzle
FlangedOrStudded		eFlangedOrStuddedNozzle	Nozzle
DesignApprovalRequired		Boolean	Nozzle
DistanceFromCenter		Real	Nozzle
HeightUnderNozzle		Real	Nozzle
LocationRelativeToUrbend		eLocationRelativeToUrbend(Nozzle)	Nozzle
Position		ePosition(Nozzle)	Nozzle
Facing		eFacing(Nozzle)	Nozzle
Lining		ConstructionMaterial	Nozzle
Reinforced		String	Nozzle
Bore		Real	Nozzle
NominalSize		Real	Nozzle
OuterDiameter		Real	Nozzle
Rating		eRating(Nozzles)	Nozzle

FIG. 3H

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PressureRating	Real	Pressure	Nozzle
TemperatureRating	Real	Temperature	Nozzle
FlangeVelocity	Real	Velocity	Nozzle
PressureDrop	Real	PressureDiff	Nozzle
Rhov2	Real	Density Velocity Sq	Nozzle
Velocity	Real	Velocity	Nozzle
AllowableForceAxial	Real	Force	Nozzle
AllowableForceHorizontal	Real	Force	Nozzle
AllowableForceVertical	Real	Force	Nozzle
AllowableMomentAxial	Real	Force	Nozzle
AllowableMomentHorizontal	Real	Bending Moment(Torq	Nozzle
AllowableMomentVertical	Real	Bending Moment(Torq	Nozzle
⊕DistributorBelt	Real	Bending Moment(Torq	Nozzle
⊕Flange	DistributorBelt		Nozzle
Flanged	Flange		Nozzle
⊕Gasket	eFlanged(Nozzle)		Nozzle
MatingPartsFurnished	Gasket		Nozzle
⊕NozzleDome	Boolean		Nozzle
⊕Piping Terminator	NozzleDome		Nozzle
VortexBreaker	Piping Terminator		Nozzle
Threaded	Boolean		Nozzle
ThreadedParameterA	Boolean		Nozzle
ThreadedParameterB	Real	Length	Nozzle
ThreadedParameterC	Real	Length	Nozzle
	Real	Length	Nozzle

FIG. 31

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ThreadedParameterD	Real	Length	Nozzle	
ThreadedParameterE	Real	Length	Nozzle	
⊕ LinePipeMaterial	ConstructionMaterial		Nozzle	
⊕ ReinforcingPlateMaterial	ConstructionMaterial		Nozzle	
Remarks	String		MechanicalComponent	
NamePrecedent	String		MechanicalComponent	
ApplicableTo	eApplicableTo(ProcessPlantEquipment)		ProcessPlantEquipment	

FIG. 3J

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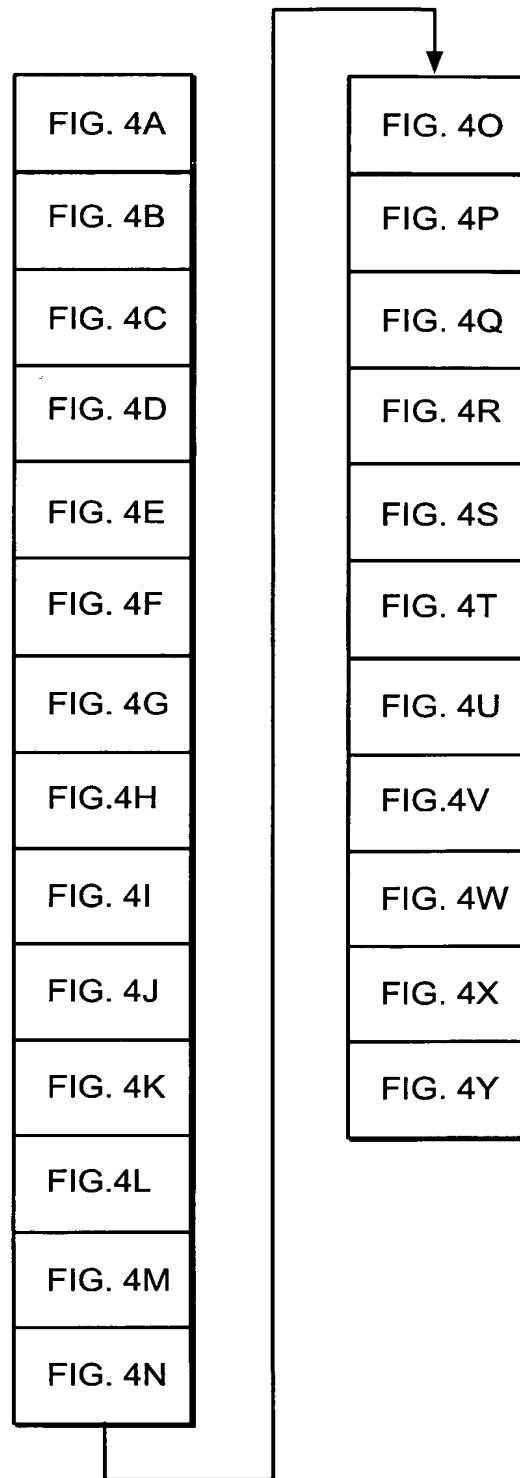


FIG. 4

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Composite View 'ShellAndTubeHeatExchanger'				
Name	Type	Quantity	Type	Route
AdditionalRemarks	String			AdditionalRemarks
BaffleCut	Real	Percentage	PQI	Assemblies.Bundle,Baffles,BaffleCut
BaffleCutOrientation	String			Assemblies.Bundle,Baffles,Orientation
BaffleCutType	String			
BafflePercentageCutForAreaBasis	Real	Percentage		Assemblies.Bundle,Baffles,PercentAreaCut
BafflePercentageCutForShellInnerDiameter	Real	Percentage		Assemblies.Bundle,Baffles,PercentDiameterFirstCut
BafflePitch	Real	Length	normal	Assemblies.Bundle,Baffles,Pitch
BafflePitchMaximum	Real	Length	small	
BafflesAndSupportPlates	String			Assemblies.Bundle,Baffles,MaterialOfConstruction,MaterialName
BaffleShellDiameterClearance	Real	Length	normal	Assemblies.Bundle,BaffleToShellClearance
BafflesMaterial	String			Assemblies.Bundle,Baffle,MaterialOfConstruction,MaterialName
BafflesNumber	Integer			Assemblies.Bundle,NumberOfBaffles
BafflesNumberAllowable	String			
BafflesNumberMinimize	Boolean			
BaffleSpacing	Real	Length		Assemblies.Bundle,NominalBaffleSpacing
BaffleSpacingFromInlet	Real	Length		Assemblies.Bundle,Tubesheets(1).DistanceFromFrontTubeSheetFace
BaffleSpacingFromOutlet	Real			
BaffleSpacingMaximum	Real	Length	small	
BaffleSpacingMinimum	Real	Length	small	
BafflesPresent	String			
BafflesSpacersTieRodsCorrosionAllowance	Real	Length	small	Assemblies.Bundle,Tubesheets(1).TieRods,MaterialOfConstruction,CorrosionAllowance

FIG. 4A

BaffleSpacersTieRodsMaterial	String		Assemblies,Bundle,Tubesheets(1),TieRods,MaterialOfConstruction,MaterialName
BaffleThickness	Real	Length small	Assemblies,Bundle,Baffles,Thickness
BaffleType	eType(ExchangerBaffle)		Assemblies,Bundle,Baffles,BaffleType
BundleDiameter	Real	Length	
BundleEntranceRv2	Real	Density Velocity Sq	Assemblies,PerformanceCriteria,ShellsidePerformance,BundleEntranceRhov2
BundleExitRv2	Real	Density Velocity Sq	Assemblies,PerformanceCriteria,ShellsidePerformance,BundleExitRhov2
BundleFirstTubeRowToInletDistance	Real	Length small	
BundleLastTubeRowToOutletDistance	Real	Length small	
BundleOuterDiameterMaximum	Real	Length (m)	Assemblies,Bundle,MaximumDesignCriteria(1),BundleOuterDiameter
BundleShellDiameterClearance	Real	Length small	
BundleWeight	Real	Mass	Assemblies,Bundle,Weights,TotalOperating
BundleNormalOfFull	String		
BypassSealRequired	Boolean		Assemblies,Bundle,BypassSeal,BypassSealRequired
BypassSealType	String		Assemblies,Bundle,BypassSeal,SealType
ChannelBodyFlangeMaterial	String		Assemblies,Channel,Body,FlangeMaterial,MaterialName
ChannelBodyFlangesCorrosionAllowance	Real	Length small	Assemblies,Channel,Body,FlangeMaterial,CorrosionAllowance
ChannelCorrosionAllowance	Real	Length small	Assemblies,Channel,ChannelMaterial,CorrosionAllowance
ChannelCoverCorrosionAllowance	Real	Length small	Assemblies,Channel,CoverMaterial,CorrosionAllowance
ChannelCoverMaterial	String		Assemblies,Channel,CoverMaterial,MaterialName
ChannelExitInsulationMaterial	String		Assemblies,Channel,ExitInsulationMaterial,MaterialName
ChannelExitInsulationThickness	Real	Length small	Assemblies,Channel,ExitInsulationMaterial,Thickness
ChannelExternalBoltingCorrosionAllowance	Real	Length small	Assemblies,Channel,ExternalBoltingMaterial,CorrosionAllowance
ChannelExternalBoltingMaterial	String		Assemblies,Channel,ExternalBoltingMaterial,MaterialName
ChannelHeadCorrosionAllowance	Real	Length small	Assemblies,Channel,CoverMaterial,CorrosionAllowance

FIG. 4B

ChannelHeadMaterial	String		Assemblies,Channel,CoverMaterial,MaterialName
ChannelInletInsulationMaterial	String		Assemblies,Channel,InletInsulationMaterial,MaterialName
ChannelInletInsulationThickness	Real	Length small	Assemblies,Channel,InletInsulationMaterial,Thickness
ChannelInternalBoilingCorrosionAllowance	Real	Length small	Assemblies,Channel,InletInsulationMaterial,CorrosionAllowance
ChannelInternalBoilingMaterial	String		Assemblies,Channel,InternalBoilingMaterial,MaterialName
ChannelMaterial	String		Assemblies,Channel,ChannelMaterial,MaterialName
ChannelNozzleFlangeMaterial	String		Assemblies,Channel,NozzleFlangeMaterial,MaterialName
ChannelNozzleFlangeCorrosionAllowance	Real	Length small	Assemblies,Channel,NozzleFlangeMaterial,CorrosionAllowance
ChannelNozzleNeckMaterial	String		Assemblies,Channel,NozzleNeckMaterial,MaterialName
ChannelNozzleNecksCorrosionAllowance	Real	Length small	Assemblies,Channel,NozzleNeckMaterial,CorrosionAllowance
ChannelNozzleReinforcementCorrosionAllowance	Real	Length small	Assemblies,Channel,NozzleReinforcementMaterial,CorrosionAllowance
ChannelNozzleReinforcementMaterial	String		Assemblies,Channel,NozzleReinforcementMaterial,MaterialName
ChannelPipeandStubEndsCorrosionAllowance	Real	Length small	Assemblies,Channel,PipeAndStubEndsMaterial,CorrosionAllowance
ChannelPipeandStubEndsMaterial	String		Assemblies,Channel,PipeAndStubEndsMaterial,MaterialName
CodeRequirements	String		AsmeCode
ColdInletStream	MaterialFlowSpecification		MaterialPorts[ThermalAllocation="ColdIn"].Flow
ColdOutletStream	MaterialFlowSpecification		MaterialPorts[ThermalAllocation="ColdOut"].Flow
ColdSideDesignPressure	Real	Pressure abs	ColdSide.NormalDesignCriteria.Pressure
ColdSideDesignTemperature	Real	Temperature tmp	ColdSide.NormalDesignCriteria.Temperature
ColdSideFlangeFacing	String		ColdSide.FlangeFacing
ColdSideFlangeRating	String		ColdSide.FlangeRating
ColdSideFluidAllocation	eHotFluidAllocation/Shel		NormalDesignCriteria(1).ColdFluidAllocation
ColdSideFluidName	String		MaterialPorts[ThermalAllocation="ColdIn"].Flow Name
ColdSideFoulingResistance	Real	Thermal Resistance	ColdSide.FoulingResistance

FIG. 4C

ColdSideFoulingThickness	Real	Length small	ColdSide.FoulingThickness
ColdSideFullVacuum	Boolean		ColdSide.NormalDesignCriteria.FullVacuum
ColdSideGasketMaterial	String		
ColdSideHeatBalanceMethod	String		
ColdSideHeatCurves	ExchangerFluidProfile		ColdSide.FluidProfiles(*)
ColdSideInletEnthalpyMassBasis	Real	Enthalpy	MaterialPorts[ThermalAllocation="ColdIn"].Flow.BulkFlow.EnthalpyMassBasis
ColdSideInletH2MoleConcentration	Real	CondenTrm(Mol/Mol)	MaterialPorts[ThermalAllocation="ColdIn"].Flow.BulkFlow.DefinedPointPhysicalProperties.Hydrog
ColdSideInletH2MoleConcentration	Real	CondenTrm(Mol/Mol)	MaterialPorts[ThermalAllocation="ColdIn"].Flow.BulkFlow.DefinedPointPhysicalProperties.Hydrog
ColdSideInletInertMW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="ColdIn"].Flow.NonCondensibles.MolecularWeight
ColdSideInletMassQuality	Real	Fraction	MaterialPorts[ThermalAllocation="ColdIn"].Flow.VapourPhaseMassFraction
ColdSideInletPressure	Real	Pressure abs	MaterialPorts[ThermalAllocation="ColdIn"].Flow.BulkFlow.Pressure
ColdSideInletTemperature	Real	Temperature tmp	MaterialPorts[ThermalAllocation="ColdIn"].Flow.BulkFlow.Temperature
ColdSideInletVaporH2MFLOW	Real	Mass flow normal	MaterialPorts[ThermalAllocation="ColdIn"].Flow.VapourPhaseDefinedPointPhysicalProperties.Hy
ColdSideInletVaporH2MW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="ColdIn"].Flow.VapourPhaseDefinedPointPhysicalProperties.Hy
ColdSideInletVaporH2OMW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="ColdIn"].Flow.VapourPhaseDefinedPointPhysicalProperties.H2
ColdSideInletVaporHydrocarbonMassFlow	Real	Mass flow normal	MaterialPorts[ThermalAllocation="ColdIn"].Flow.VapourPhaseDefinedPointPhysicalProperties.Hy
ColdSideInletVaporHydrocarbonMW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="ColdIn"].Flow.VapourPhaseDefinedPointPhysicalProperties.Hy
ColdSideLiquidHeatTransferCoefficientSpecified	Real	Heat Transfer Coef	
ColdSideMassFlow	Real	Mass flow normal	MaterialPorts[ThermalAllocation="ColdIn"].Flow.BulkFlow.MassFlowRate
ColdSideMolecularWeight	Real	Molar Mass	MaterialPorts[ThermalAllocation="ColdIn"].Flow.BulkFlow.MolecularWeight
ColdSideOutletEnthalpyMassBasis	Real	Enthalpy	MaterialPorts[ThermalAllocation="ColdOut"].Flow.BulkFlow.EnthalpyMassBasis
ColdSideOutletH2MoleConcentration	Real	CondenTrm(Mol/Mol)	MaterialPorts[ThermalAllocation="ColdOut"].Flow.BulkFlow.DefinedPointPhysicalProperties.Hydrog
ColdSideOutletH2MoleConcentration	Real	CondenTrm(Mol/Mol)	MaterialPorts[ThermalAllocation="ColdOut"].Flow.BulkFlow.DefinedPointPhysicalProperties.H2sMo
ColdSideOutletInertMW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="ColdOut"].Flow.NonCondensibles.MolecularWeight

FIG. 4D

ColdSideOutletMassQuality	Real	Fraction	MaterialPorts[ThermalAllocation="ColdOut"].Flow.VapourPhase.MassFraction
ColdSideOutletPressure	Real	Pressure abs	MaterialPorts[ThermalAllocation="ColdOut"].Flow.BulkFlow.Pressure
ColdSideOutletTemperature	Real	Temperature tmp	MaterialPorts[ThermalAllocation="ColdOut"].Flow.BulkFlow.Temperature
ColdSideOutletVaporH2MassFlow	Real	Mass flow normal	MaterialPorts[ThermalAllocation="ColdOut"].Flow.VapourPhaseDefinedPointPhysicalProperties.H
ColdSideOutletVaporH2MW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="ColdOut"].Flow.VapourPhaseDefinedPointPhysicalProperties.H
ColdSideOutletVaporH2QMW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="ColdOut"].Flow.VapourPhaseDefinedPointPhysicalProperties.H
ColdSideOutletVaporHydrocarbonMassFlow	Real	Mass flow normal	MaterialPorts[ThermalAllocation="ColdOut"].Flow.VapourPhaseDefinedPointPhysicalProperties.H
ColdSideOutletVaporHydrocarbonMW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="ColdOut"].Flow.VapourPhaseDefinedPointPhysicalProperties.H
ColdSidePhaseIndicator	eForm[MaterialFlowSpe		MaterialPorts[ThermalAllocation="ColdOut"].Flow.Form
ColdSidePressureDrop	Real	Pressure Diff	ColdSide.NormalOperatingCriteria.PressureDrop
ColdSidePressureDropAllowable	Real	Pressure Diff	ColdSide.MaximumDesignCriteria.AllowablePressureDrop
ColdSidePressureDropInNozzlesAllowable	Real		
ColdSideTestPressure	Real	Pressure abs	
ColdSideTestPressure	Real	Pressure abs	
ColdSideTwoPhaseHeatTransferCoefficientSpecified	Real	Heat Transfer Coef	
ColdSideVacuumPressure	Real	Pressure vacuum	
ColdSideVacuumReferenceTemperature	Real	Temperature tmp	ColdSide.NormalDesignCriteria.Vacuum.Temperature
ColdSideVapourHeatTransferCoefficientSpecified	Real	Heat Transfer Coef	
ColdSideVelocityMaximumAllowable	Real	Velocity normal	
ColdSideVelocityMinimumAllowable	Real	Velocity normal	
ConnectionDescription	String		Nozzles(*)Description
ConnectionFacing	eFacing(Flange)		Nozzles(*)Flange.Facing
ConnectionMark	String		Nozzles(*)NozzleMark
ConnectionNumberRequired	Integer		Nozzles(*)NumberRequired

FIG. 4E

ConnectionRating	eRating(Nozzle)		Nozzles(*),Rating
ConnectionScheduleSize	Real	Length	Nozzles(*),NominalSize
CorrectedandWeightedMid	Real	Temperature Diff	PerformanceCriteria_LmidWeighted
Correctedmid	Real	Temperature Diff	PerformanceCriteria_LmidCorrected
CostingUserTag	String		CostData,UserTag
Customer	String		Customer,AbbreviatedName
Description	String		Description
DesignGuidelines	String		DesignGuidelines(1)
DesignShellMeanMetalTemperature	Real	Temperature	Assemblies,ShellSide,Shell,NormalDesignCriteria(1),MetalTemperature
DesignShellPressure	Real	Pressure gauge	Assemblies,ShellSide,Shell,NormalDesignCriteria(1),Pressure
DesignTubeMeanMetalTemperature	Real	Temperature	Assemblies,Bundle,TubeType(1),NormalDesignCriteria(1),MetalTemperature
DesignTubePressure	Real	Pressure gauge	NormalDesignCriteria(1),Pressure
DesignTubeSheetMeanMetalTemperature	Real	Temperature	Assemblies,Bundle,Tubesheets(1),NormalDesignCriteria(1),MetalTemperature
DirectFieldCost	Real	Currency	CostData,DirectFieldCost
ExchangerIsDoublePipe	Boolean		ExchangerIsDoublePipe
ExchangerType	String		ExchangerType
ExchangerWeightEmpty	Real	Mass	Weights,Empty
ExchangerWeightFullOfWater	Real	Mass	Weights,WaterFilled
ExpansionJointDesignLifeCycles	Integer		Assemblies,ShellSide,ExpansionJoints,DesignLifeCycles
ExpansionJointMaterial	String		Assemblies,ShellSide,ExpansionJoints,MaterialOfConstruction,MaterialName
ExpansionJointRequired	Boolean		Assemblies,ShellSide,ExpansionJointsRequired
ExpansionJointType	eType(ExpansionJoint)		Assemblies,ShellSide,ExpansionJoints,JointType
Fabricator	String		Fabricator
FloatingHeadCoverBoltMaterial	String		Assemblies,FloatingHead,CoverBoltMaterial,MaterialName

FIG. 4F

FloatingHeadCoverMaterial	String	Assemblies, FloatingHead, CoverBoltMaterial, MaterialName
FloatingHeadGasketMaintenanceFactor	Real	Pressure abs
FloatingHeadGasketMaterial	String	Assemblies, FloatingHead, Gasket, MaintenanceFactor
FloatingHeadGasketThickness	Real	Length small
FloatingHeadGasketYFactor	Real	Pressure abs
FrontEndTemaType	eTemaType[ExchangeE	Assemblies, FloatingHead, Gasket, MaterialOfConstruction, Thickness
GasketsSpareSetsRequired	Integer	Assemblies, FloatingHead, Gasket, MaterialOfConstruction, MaximumYieldStrength
GeneralOfficeOverhead	Real	Assemblies, Ends(1), Tema Type
HeatExchanged	Real	Assemblies, Gasket, NumberOfSpares
HeatTransferRateClean	Real	CostData, GeneralOfficeOverhead
HeatTransferRateFouled	Real	PerformanceCriteria, PerformanceData(1), HeatDuty
HeatTransferRateRequired	Real	Heat Transfer Coef
HotInletStream	MaterialFlowSpecification	PerformanceCriteria, OverallCoefficientClean
HotOutletStream	MaterialFlowSpecification	Heat Transfer Coef
HotSideDesignPressure	Real	PerformanceCriteria, OverallCoefficientFouled
HotSideDesignTemperature	Real	Heat Transfer Coef
HotSideEnthalpy	Real	PerformanceCriteria, OverallHeatTransferCoefficient
HotSideFlangeFacing	String	MaterialPorts[ThermalAllocation="HotIn"], Flow
HotSideFlangeFacing	String	MaterialPorts[ThermalAllocation="HotOut"], Flow
HotSideFlangeRating	String	Pressure abs
HotSideFluidAllocation	eHotFluidAllocation[Shel	HotSide, NormalDesignCriteria, Pressure
HotSideFluidName	String	HotSide, NormalDesignCriteria, Temperature
HotSideFoulingResistance	Real	HotSide, HeatingCoolingCurve(1), DataPoints(1), BulkFlow, ThermodynamicProperties, SpecificEntha
HotSideFoulingThickness	Real	Enthalpy
		HotSide, FlangeFacing
		HotSide, FlangeFacing
		HotSide, FlangeRating
		NormalDesignCriteria(1), HotFluidAllocation
		MaterialPorts[ThermalAllocation="HotIn"], Flow, Name
		Thermresist POT
		Lengthsmall
		HotSide, Fouling Thickness

FIG. 4G

HotSideFullVacuum	Boolean		HotSide,NormalDesignCriteria,FullVacuum
HotSideFullVacuumReferenceTemperature	Real	Temperature tmp	HotSide,NormalDesignCriteria,VacuumTemperature
HotSideGasketMaterial	String		
HotSideHeatBalanceMethod	String		
HotSideHeatCurves	ExchangerFluidProfile		HotSide FluidProfiles(*)
HotSideInletEnthalpyMassBasis	Real	Enthalpy	MaterialPorts[ThermalAllocation="HotIn"],Flow,BulkFlow,Enthalpy,MassBasis
HotSideInlet2MoleConcentration	Real	Conc. % mol/mol	MaterialPorts[ThermalAllocation="HotIn"],Flow,BulkFlow,DefinedPointPhysicalProperties,Hydroge
HotSideInlet2SMoleConcentration	Real	Conc. % mol/mol	MaterialPorts[ThermalAllocation="HotIn"],Flow,BulkFlow,DefinedPointPhysicalProperties,H2sMole
HotSideInletInertMW	Real	MolarMass (g/mol)	MaterialPorts[ThermalAllocation="HotIn"],Flow,NonCondensibles,MolecularWeight
HotSideInletMassQuality	Real	Fraction	MaterialPorts[ThermalAllocation="HotIn"],Flow,VapourPhase,MassFraction
HotSideInletPressure	Real	Pressure abs	MaterialPorts[ThermalAllocation="HotIn"],Flow,BulkFlow,Pressure
HotSideInletTemperature	Real	Temperature tmp	MaterialPorts[ThermalAllocation="HotIn"],Flow,BulkFlow,Temperature
HotSideInletVaporFlowrate	Real	Mass flow small	MaterialPorts[ThermalAllocation="HotIn"],Flow,VapourPhase,MassFlowRate
HotSideInletVaporH2MassFlow	Real	Mass flow normal	MaterialPorts[ThermalAllocation="HotIn"],Flow,VapourPhase,DefinedPointPhysicalProperties,Hyd
HotSideInletVaporH2MW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="HotIn"],Flow,VapourPhase,DefinedPointPhysicalProperties,Hyd
HotSideInletVaporH20MW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="HotIn"],Flow,VapourPhase,DefinedPointPhysicalProperties,Hyd
HotSideInletVaporHydrocarbonMassFlow	Real	Mass flow normal	MaterialPorts[ThermalAllocation="HotIn"],Flow,VapourPhase,DefinedPointPhysicalProperties,Hyd
HotSideInletVaporHydrocarbonMW	Real	Molar Mass(g/mol)	MaterialPorts[ThermalAllocation="HotIn"],Flow,VapourPhase,DefinedPointPhysicalProperties,Hyd
HotSideLiquidHeatTransferCoefficientSpecified	Real	Heat Transfer Coef	
HotSideMassFlow	Real	Mass flow normal	MaterialPorts[ThermalAllocation="HotIn"],Flow,BulkFlow,MassFlowRate
HotSideMolecularWeight	Real	Molar Mass	MaterialPorts[ThermalAllocation="HotIn"],Flow,BulkFlow,MolecularWeight
HotSideOutletEnthalpyMassBasis	Real	Enthalpy	MaterialPorts[ThermalAllocation="HotOut"],Flow,BulkFlow,Enthalpy,MassBasis
HotSideOutletH2MoleConcentration	Real	Conc. % mol/mol	MaterialPorts[ThermalAllocation="HotOut"],Flow,BulkFlow,DefinedPointPhysicalProperties,Hydro
HotSideOutletH2SMoleConcentration	Real	Conc. % mol/mol	MaterialPorts[ThermalAllocation="HotOut"],Flow,BulkFlow,DefinedPointPhysicalProperties,H2sMo

FIG. 4H

HotSideOutletInertMW	Real	MolarMass (g/mol)	MaterialPorts[ThermalAllocation="HotOut"]Flow, NonCondensibles, MolecularWeight
HotSideOutletMassQuality	Real	Fraction	MaterialPorts[ThermalAllocation="HotOut"]Flow, VapourPhase, MassFraction
HotSideOutletPressure	Real	Pressure abs	MaterialPorts[ThermalAllocation="HotOut"]Flow, BulkFlow, Pressure
HotSideOutletTemperature	Real	Temperature	MaterialPorts[ThermalAllocation="HotOut"]Flow, BulkFlow, Temperature
HotSideOutletVaporH2MassFlow	Real	Mass flow normal	MaterialPorts[ThermalAllocation="HotOut"]Flow, VapourPhase, DefinedPoint, PhysicalProperties, Hy
HotSideOutletVaporH2MW	Real	Molar Mass (g/mol)	MaterialPorts[ThermalAllocation="HotOut"]Flow, VapourPhase, DefinedPoint, PhysicalProperties, Hy
HotSideOutletVaporH20MW	Real	Molar Mass (g/mol)	MaterialPorts[ThermalAllocation="HotOut"]Flow, VapourPhase, DefinedPoint, PhysicalProperties, H2
HotSideOutletVaporHydrocarbonMassFlow	Real	Mass flow normal	MaterialPorts[ThermalAllocation="HotOut"]Flow, VapourPhase, DefinedPoint, PhysicalProperties, Hy
HotSideOutletVaporHydrocarbonMW	Real	Molar Mass (g/mol)	MaterialPorts[ThermalAllocation="HotOut"]Flow, VapourPhase, DefinedPoint, PhysicalProperties, Hy
HotSidePhaseIndicator	eForm(MaterialFlowSpec		MaterialPorts[ThermalAllocation="HotIn"]Flow, Form
HotSidePressureDrop	Real	Pressure Diff	HotSide, NormalOperatingCriteria, PressureDrop
HotSidePressureDropAllowable	Real	Pressure Diff	HotSide, MaximumDesignCriteria, AllowablePressureDrop
HotSidePressureDropInNozzlesAllowable	Real		
HotSideTestPressure	Real	Pressure abs	
HotSideTwoPhaseHeatTransferCoefficientSpecif	Real	Heat Transfer Coef	
HotSideVacuumPressure	Real	Pressure vacuum	
HotSideVapourHeatTransferCoefficientSpecified	Real	Heat Transfer Coef	
HotSideVelocityMaximumAllowable	Real	Velocity normal	
HotSideVelocityMinimumAllowable	Real	Velocity normal	
Hydro TestPressureField	Real	Absolute Pressure	InspectionsAndTests, Hydrostatic TestPressureField
Hydro TestPressureShop	Real	Absolute Pressure	InspectionsAndTests, Hydrostatic TestPressureShop
ImpingementProtection	Boolean		Assemblies Bundle, ImpingementProtection
ImpingementProtectionType	ePlateTypeImpingement		Assemblies Bundle, ImpingementPlate, PlateType

FIG. 4I

ImpingementProtectionType	ePlateType(Impingemen		Assemblies, Bundle, ImpingementPlate, PlateType
InletNozzleRv2	Real	Density Velocity Sq	Assemblies, PerformanceCriteria, ShellSidePerformance, LimitInletRhov2
InnerDiameter	Real	Length normal	Assemblies, ShellSide, InnerDiameter
InsulationDensity	Real	Density	Insulation, Density
InsulationMaterial	String		Insulation, MaterialName
InsulationPurpose	String		Insulation, Purpose
InsulationSpecification	String		Insulation, Specification
InsulationThickness	Real	Length small	Insulation, Thickness
ItemNumber	String		ItemNumber
JobNo	String		JobNumber
KettleDiameterInner	Real	Length small	
KettleDiameterOuter	Real	Length small	
Location	String		Location, Site
LongitudinalBaffleSealType	eSealType(LongitudinalB		Assemblies, Bundle, LongitudinalBaffles, SealType
LongitudinalBaffleType	String		Assemblies, Bundle, LongitudinalBaffles, Type
Manufacturer	String		Manufacturer
MaterialComponentCost	Real	Currency	CostData, MaterialComponentCost
MAWPCalculation	Boolean		CalculateMAWP
MAWPHotAndCorroded	Real	Pressure abs	MAWPHotAndCorroded
MAWPNewAndCold	Real	Pressure abs	MAWPNewAndCold
ModelNumber	String		ModelNumber
NormalShellMeanMetalTemperature	Real	Temperature	Assemblies, ShellSide, Shell, NormalDesignCriteria(1), MetalTemperature
NormalShellPressure	Real	Pressure gauge	NormalContent, BulkAmount, Pressure
NormalTubeMeanMetalTemperature	Real	Temperature	Assemblies, Bundle, TubeType(1), NormalDesignCriteria(1), MetalTemperature

FIG. 4J

NormalTubePressure	Real		Pressure gauge	NormalContents,BulkAmount,Pressure
NormalTubeSheetMeanMetalTemperature	Real		Temperature	Assemblies Bundle,Tube Type(1), NormalDesignCriteria(1),Metal Temperature
Notes	String			Notes(*)
NumberOfCrossPasses	Integer			Assemblies Bundle,NumberOfCrosspasses
NumberOfUnits	Integer			NumberInService
NumberRequired	Integer			NumberRequired
Orientation	String			Orientation
PONumber	String			PoNumber
PressureShellDesignGauge	Real		Pressure gauge	NormalDesignCriteria(1),ShellSideDesign,Pressure
PressureTubeDesignGauge	Real		Pressure gauge	NormalDesignCriteria(1),ShellSideDesign,Pressure
PressureUnit	String			CompleteItemNumber
Profit	Real		Currency	CostData,Profit
QuotedCost	Real		Currency	CostData,QuotedCost
RearEndTemaType	eTemaType(Exchangert			Assemblies Ends(2),Tema Type
ReasonsForStressRelief	String			InspectionAndTests,ReasonsForStressRelief
RefName/carus	String			CostingReference
SealingStripNumberOfPairs	Integer			Assemblies,Bundle,NumberOfSealStrips
SealingStripTubeRowsPer	Real			
ServiceOfUnit	String			Function
ShellAndTubeOnEquipmentSpecification	Boolean			ShellAndTubeOnEquipmentSpecification
ShellAndTubeOnProcessSpecificSS	Boolean			ShellAndTubeOnProcessSpecificSS
ShellBodyFlangeCorrosionAllowance	Real		Length small	Assemblies,ShellSide,Body,FlangeMaterial,CorrosionAllowance
ShellBodyFlangeMaterial	String			Assemblies,ShellSide,Body,FlangeMaterial,MaterialName
ShellCorrosionAllowance	Real		Length Inches	NormalDesignCriteria(1),ShellSideDesign,AllowableCorrosionAllowance

FIG. 4K

ShellCoverMaterial	String		Assemblies, ShellSide, CoverMaterial, MaterialName
ShellDiameterIncrements	Real		NormalDesignCriteria, ShellSideDesign, ShellDiameterIncrement
ShellDiameterInner	Real	Length	Assemblies, ShellSide, Shell, InnerDiameter
ShellDiameterMaximum	Real	Length small	MaximumDesignCriteria, ShellSideDesign, MaximumShellDiameter
ShellDiameterMinimum	Real	Length small	NormalDesignCriteria(1), ShellSideDesign, AllowableCorrosionAllowance
ShellDiameterMinimum	Real	Length small	NormalDesignCriteria(1), ShellSideDesign, AllowableCorrosionAllowance
ShellDiameterOuter	Real	Length	Assemblies, ShellSide, OuterDiameter
ShellExpansionJoint	String		Assemblies, ShellSide, ExpansionJoints, MaterialOfConstruction, MaterialName
ShellExpansionJointCorrosionAllowance	Real	Length	Assemblies, ShellSide, ExpansionJoints, MaterialOfConstruction, CorrosionAllowance
ShellExternalBoltingCorrosionAllowance	Real	Length small	Assemblies, ShellSide, ExternalBoltingMaterial, CorrosionAllowance
ShellExternalBoltingMaterial	String		Assemblies, ShellSide, ExternalBoltingMaterial, MaterialName
ShellHeadCorrosionAllowance	Real	Length	Assemblies, ShellSide, Shell, Heads(1), MaterialOfConstruction, CorrosionAllowance
ShellHeadMaterial	String		Assemblies, ShellSide, Shell, Heads(1), MaterialOfConstruction, MaterialName
ShellInternalBoltingCorrosionAllowance	Real	Length small	Assemblies, ShellSide, InternalBoltingMaterial, CorrosionAllowance
ShellInternalBoltingMaterial	String		Assemblies, ShellSide, InternalBoltingMaterial, MaterialName
ShellMaterial	String		Assemblies, ShellSide, Shell, MaterialOfConstruction, MaterialName
ShellMaterialClass	String		Assemblies, ShellSide, MaterialOfConstruction, MaterialClass
ShellNozzleFlangeCorrosionAllowance	Real	Length small	Assemblies, ShellSide, NozzleFlangeMaterial, CorrosionAllowance
ShellNozzleFlangeMaterial	String		Assemblies, ShellSide, NozzleFlangeMaterial, MaterialName
ShellNozzleNeckMaterial	String		Assemblies, ShellSide, NozzleNeckMaterial, MaterialName
ShellNozzleNecksCorrosionAllowance	Real	Length small	Assemblies, ShellSide, NozzleNeckMaterial, CorrosionAllowance
ShellNozzleReinforcementCorrosionAllowance	Real	Length	Assemblies, ShellSide, Shell, Nozzles(1), MaterialOfConstruction, CorrosionAllowance
ShellNozzleReinforcementMaterial	String		Assemblies, ShellSide, Shell, Nozzles(1), Reinforced
ShellPassesNumberPerShell	Integer		Assemblies, ShellSide, Shell, NumberShellPasses

FIG. 4L

ShellPipeandSubEndCorrosionAllowance	Real	Length small	Assemblies, ShellSide, PipeAndSubEndMaterial, CorrosionAllowance
ShellPipeandSubEndMaterial	String		Assemblies, ShellSide, PipeAndSubEndMaterial, MaterialName
ShellSideAverageFilmCoefficient	Real	Heat Transfer Coef	Assemblies, PerformanceCriteria, ShellSidePerformance, BulkFilmCoefficient
ShellSideCleaning	String		Assemblies, ShellSide MechanicalCleaning
ShellSideCorrosionAllowance	Real	Length	Assemblies, ShellSide, MaterialConstruction, CorrosionAllowance
ShellSideCrossflowFraction	Real	Fraction	
ShellSideDesignPressure	Real	Pressure gauge	Assemblies, ShellSide, NormalDesignCriteria(1), Pressure
ShellSideDesignPressureMaximum	Real	Pressure abs	Assemblies, ShellSide, MaximumDesignCriteria, Pressure
ShellSideDesignTemperature	Real	Temperature	Assemblies, ShellSide, NormalDesignCriteria(1), Temperature
ShellSideDesignTemperatureMaximum	Real	Temperature tmp	Assemblies, ShellSide, MaximumDesignCriteria, Temperature
ShellSideDrainNozzleNumber	Integer		Assemblies, ShellSide, Nozzles["NozzleFunction="Drain"], Number
ShellSideDrainNozzleRating	eNozzleRating2_PIP VEI		Assemblies, ShellSide, Nozzles["NozzleFunction="Drain"], Rating
ShellSideDrainNozzleSize	Real	Length	Assemblies, ShellSide, Nozzles["NozzleFunction="Drain"], NominalSize
ShellSideFluidName	String		MaterialPorts[PhysicalAllocation=ShellIn], Flow, Name
ShellSideFoulingCoefficient	Real	Heat Transfer Coef	Assemblies, PerformanceCriteria, ShellSidePerformance, FoulingCoefficient
ShellSideFoulingResistance	Real	Thermal Resistance	Assemblies, PerformanceCriteria, ShellSidePerformance, FoulingResistance
ShellSideGasketMaintenanceFactor	Real	Pressure abs	Assemblies, ShellSide, Gasket, MaintenanceFactor
ShellSideGasketMaterial	String		Assemblies, Gasket, MaterialOfConstruction, MaterialName
ShellSideGasketThickness	Real	Length small	Assemblies, ShellSide, Gasket, BodyMaterial, Thickness
ShellSideGasketVFactor	Real	Pressure abs	Assemblies, ShellSide, Gasket, MinimumDesignSealingStress
ShellSideInletNozzleInsideDiameter	Real	Length small	Assemblies, ShellSide, Nozzles["NozzleFunction="Inlet"], Bore
ShellSideInletNozzleNumber	Integer		Assemblies, ShellSide, Nozzles["NozzleFunction="Inlet"], Number
ShellSideInletNozzleRating	eNozzleRating1_PIP VEI		Assemblies, ShellSide, Nozzles["NozzleFunction="Inlet"], Rating
ShellSideInletNozzleRhoV2	Real	Density VelocitySq	Assemblies, ShellSide, Nozzles["NozzleFunction="Inlet"], RhoV2

FIG. 4M

ShellSideInletNozzleSize	Real	Length	Assemblies, ShellSide, Nozzles[NozzleFunction="Inlet"], NominalSize
ShellSideInletNozzleType	String		Assemblies, ShellSide, Nozzles[NozzleFunction="Inlet"], Type
ShellSideInletPressure	Real	Pressure abs	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, BulkFlow, Pressure
ShellSideInletTemperature	Real	Temperature tmp	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, BulkFlow, Temperature
ShellSideIntermediateNozzleNumber	Integer		Assemblies, ShellSide, Nozzles[NozzleFunction="Intermediate"], Number
ShellSideIntermediateNozzleRating	eNozzleRating1_PIP VEG		Assemblies, ShellSide, Nozzles[NozzleFunction="Intermediate"], Rating
ShellSideIntermediateNozzleRhoV2	Real	Density Velocity Sq	Assemblies, ShellSide, Nozzles[NozzleFunction="Intermediate"], RhoV2
ShellSideIntermediateNozzleSize	Real	Length	Assemblies, ShellSide, Nozzles[NozzleFunction="Intermediate"], NominalSize
ShellSideIntermediateNozzleType	String		Assemblies, ShellSide, Nozzles[NozzleFunction="Intermediate"], Type
ShellSideLatentHeat	Real	Latent heat normal	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, BulkFlow, ThermodynamicProperties, HeatOfVapo
ShellSideLatentHeat	Real	Latent heat normal	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, BulkFlow, ThermodynamicProperties, HeatOfVapo
ShellSideLatentHeatReferenceTemperature	Real	Temperature	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, BulkFlow, TransportProperties, Reference Temper
ShellSideLiquidInletDensity	Real	Density	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, Liquid1Phase, PVTProperties, DensityMassBasis
ShellSideLiquidInletFlow	Real	Flow Rate(Mass)	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, Liquid1Phase, MassFlowRate
ShellSideLiquidInletSpecificHeat	Real	Spec Heat Cap (Ma	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, Liquid1Phase, ThermodynamicProperties, HeatCa
ShellSideLiquidInletSurfaceTension	Real	Surface Tension	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, Liquid1Phase, TransportProperties, Surface Tensio
ShellSideLiquidInletThermalConductivity	Real	Thermal Conductivi	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, Liquid1Phase, TransportProperties, ThermalCond
ShellSideLiquidInletViscosity	Real	Dynamic Viscosity	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, Liquid1Phase, TransportProperties, Viscosity
ShellSideLiquidOutletDensity	Real	Density	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, Liquid1Phase, PVTProperties, DensityMassBasis
ShellSideLiquidOutletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, Liquid1Phase, MassFlowRate
ShellSideLiquidOutletNozzleInsideDiameter	Real	Length small	Assemblies, ShellSide, Nozzles[NozzleFunction="LiquidOutlet"], Bore
ShellSideLiquidOutletNozzleNumber	Integer		Assemblies, ShellSide, Nozzles[NozzleFunction="LiquidOutlet"], Number
ShellSideLiquidOutletNozzleRating	eNozzleRating1_PIP VEG		Assemblies, ShellSide, Nozzles[NozzleFunction="LiquidOutlet"], Rating
ShellSideLiquidOutletNozzleRhoV2	Real	Density Velocity Sq	Assemblies, ShellSide, Nozzles[NozzleFunction="LiquidOutlet"], RhoV2

FIG. 4N

ShellSideLiquidOutletNozzleType	String		Assemblies, ShellSide, Nozzles[NozzleFunction="LiquidOutlet"], Bore
ShellSideLiquidOutletSpecificHeat	Real	Spec Heat Cap (Ma	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, Liquid1Phase, ThermodynamicProperties, HeatO
ShellSideLiquidOutletSurfaceTension	Real	Surface tension PQ	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, Liquid1Phase, TransportProperties, Surface Tens
ShellSideLiquidOutletThermalConductivity	Real	Thermal Conductivi	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, Liquid1Phase, TransportProperties, ThermalCon
ShellSideLiquidOutletViscosity	Real	Dynamic Viscosity	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, Liquid1Phase, TransportProperties Viscosity
ShellSideMinimumDesignMetalTemperature	Real	Temperature	Assemblies, ShellSide, MinimumDesignCriteria(1), MetalTemperature
ShellSideNoncondensableInletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, NonCondensible, MassFlowRate
ShellSideNoncondensableInletMw	Real	Molar Mass	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, NonCondensible, MolecularWeight
ShellSideNoncondensableOutletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, NonCondensible, MassFlowRate
ShellSideNoncondensableOutletMw	Real	Molar Mass	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, NonCondensible, PwtProperties, MolecularWeig
ShellSideNumberOfPassesPerShell	Integer		Assemblies, ShellSide, NumberOfPasses
ShellSideOutletNozzleInsideDiameter	Real	Length small	Assemblies, ShellSide, Nozzles[NozzleFunction="Outlet"], Bore
ShellSideOutletNozzleNumber	Integer		Assemblies, ShellSide, Nozzles[NozzleFunction="Outlet"], Number
ShellSideOutletNozzleRating	Real	PIP VEC	Assemblies, ShellSide, Nozzles[NozzleFunction="Outlet"], Rating
ShellSideOutletNozzleRhoV2	Real	Density Velocity Sq	Assemblies, ShellSide, Nozzles[NozzleFunction="Outlet"], RhoV2
ShellSideOutletNozzleSize	Real	Length	Assemblies, ShellSide, Nozzles[NozzleFunction="Outlet"], NominalSize
ShellSideOutletNozzleType	String		Assemblies, ShellSide, Nozzles[NozzleFunction="Outlet"], Type
ShellSideOutletTemperature	Real	Temperature Imp	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, BulkFlow, Temperature
ShellSidePressureDropAllowable	Real	Pressure Diff	Assemblies, ShellSide, NormalOperatingCriteria(1), PressureDrop
ShellSidePressureDropCalculated	Real	Pressure Diff	Assemblies, ShellSide, NormalOperatingCriteria(2), PressureDrop
ShellSideSteamInletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, Steam, MassFlowRate
ShellSideSteamOutletFlow	Real	Mass flow normal	MaterialPorts[PhysicalAllocation="ShellOut"], Flow, Steam, MassFlowRate
ShellSideTestPressure	Real	Pressure abs	Assemblies, ShellSide, InspectionAndTests, HydrostaticTestPressure
ShellSideTotalFluidQuantity	Real	Flow Rate(Mass)	MaterialPorts[PhysicalAllocation="ShellIn"], Flow, BulkFlow, MassFlowRate

FIG. 40

ShellSideVaporInletDensity	Real	Density	MaterialPorts[PhysicalAllocation="ShellIn"],Flow,VapourPhase,PvtProperties,Density,MassBasis
ShellSideVaporInletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="ShellIn"],Flow,VapourPhase,MassFlowRate
ShellSideVaporInletMw	Real	Molar Mass	MaterialPorts[PhysicalAllocation="ShellIn"],Flow,VapourPhase,MolecularWeight
ShellSideVaporInletSpecificHeat	Real	Spec Heat Cap (Ma	MaterialPorts[PhysicalAllocation="ShellIn"],Flow,VapourPhase,ThermodynamicProperties,HeatCa
ShellSideVaporInletThermalConductivity	Real	Thermal Conductiv	MaterialPorts[PhysicalAllocation="ShellIn"],Flow,VapourPhase,TransportProperties,ThermalCond
ShellSideVaporInletViscosity	Real	Dynamic Viscosity	MaterialPorts[PhysicalAllocation="ShellIn"],Flow,VapourPhase,TransportProperties,Viscosity
ShellSideVaporOutletDensity	Real	Density	MaterialPorts[PhysicalAllocation="ShellOut"],Flow,VapourPhase,PvtProperties,Density,MassBasis
ShellSideVaporOutletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="ShellOut"],Flow,VapourPhase,MassFlowRate
ShellSideVaporOutletMw	Real	Molar Mass	MaterialPorts[PhysicalAllocation="ShellOut"],Flow,VapourPhase,PvtProperties,MolecularWeight
ShellSideVaporOutletNozzleNumber	Integer		Assemblies,ShellSide,Nozzles[NozzleFunction="VapourOutlet"],Number
ShellSideVaporOutletNozzleRhoV2	Real	Density Velocity Sq	Assemblies,ShellSide,Nozzles[NozzleFunction="VapourOutlet"],RhoV2
ShellSideVaporOutletNozzleSize	Real	Length small	Assemblies,ShellSide,Nozzles[NozzleFunction="VapourOutlet"],NominalSize
ShellSideVaporOutletNozzleType	String		Assemblies,ShellSide,Nozzles[NozzleFunction="VapourOutlet"],Type
ShellSideVaporOutletSpecificHeat	Real	Spec Heat Cap (Ma	MaterialPorts[PhysicalAllocation="ShellOut"],Flow,VapourPhase,ThermodynamicProperties,HeatC
ShellSideVaporOutletThermalConductivity	Real	Thermal Conductiv	MaterialPorts[PhysicalAllocation="ShellOut"],Flow,VapourPhase,TransportProperties,ThermalCon
ShellSideVaporOutletThermalConductivity	Real	Thermal Conductiv	MaterialPorts[PhysicalAllocation="ShellOut"],Flow,VapourPhase,TransportProperties,ThermalCon
ShellSideVaporOutletViscosity	Real	Dynamic Viscosity	MaterialPorts[PhysicalAllocation="ShellOut"],Flow,VapourPhase,TransportProperties,Viscosity
ShellSideVelocity	Real	Velocity	Assemblies,PerformanceCriteria,ShellSidePerformance,MidpointVelocity
ShellSideVelocityMaximum	Real	Velocity small	Assemblies,NormalDesignCriteria,ShellSideDesign,MaximumVelocity
ShellSideVentNozzleNumber	Integer		Assemblies,ShellSide,Nozzles[NozzleFunction="Vent"],Number
ShellSideVentNozzleRating	eNozzleRating2_PIP VEI		Assemblies,ShellSide,Nozzles[NozzleFunction="Vent"],Rating
ShellSideVentNozzleSize	Real	Length	Assemblies,ShellSide,Nozzles[NozzleFunction="Vent"],NominalSize
ShellSideWaterInletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="ShellIn"],Flow,CoolingWater,MassFlowRate
ShellSideWaterOutletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="ShellOut"],Flow,CoolingWater,MassFlowRate

FIG. 4P

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ShellsInParallelMaximum	Integer		NormalDesignCriteria(1),MaximumShellsInParallel
ShellsInParallelMinimum	Integer		NormalDesignCriteria(1),MinimumShellsInParallel
ShellsInParallelNumber	Integer		NumberShellsInParallel
ShellsInSeriesMaximum	Integer		NumberDesignCriteria(1),MaximumShellsInSeries
ShellsInSeriesMinimum	Integer		NormalDesignCriteria(1),MinimumShellsInSeries
ShellsInSeriesNumber	Integer		NumberShellsInSeries
ShellsMultiple	Boolean		MultipleShells
ShellsPerUnit	Integer		NumberShellsPerUnit
ShellSupportsCorrosionAllowance	Real	Length small	Assemblies,ShellSide,Shell,Support,MaterialOfConstruction,CorrosionAllowance
ShellSupportsMaterial	String		Assemblies,ShellSide,Shell,Support,MaterialOfConstruction,MaterialName
ShellTEMAType	eShellTEMAType		Assemblies,ShellSide,TEMAShellType
ShellThickness	Real	Length small	Assemblies,ShellSide,Shell,Thickness
ShellThicknessMinimum	Real	Length	
ShopManpowerCost	Real	Currency	CostData,ShopManpowerCost
ShopOverhead	Real	Currency	CostData,ShopOverhead
ShutdownShellMeanMetalTemperature	Real	Temperature	Assemblies,ShellSide,Shell,NormalDesignCriteria(1),MetalTemperature
ShutdownShellPressure	Real	Pressure gauge	Assemblies,ShellSide,Shell,NormalDesignCriteria(1),Pressure
ShutdownTubeMeanMetalTemperature	Real	Temperature	Assemblies,Bundle,TubeType(1),NormalDesignCriteria(1),MetalTemperature
ShutdownTubePressure	Real	Pressure gauge	Assemblies,Bundle,TubeType(1),NormalDesignCriteria(1),Pressure
ShutdownTubeSheetMeanMetalTemperature	Real	Temperature	Assemblies,Bundle,Tubesheets(1),NormalDesignCriteria(1),MetalTemperature
ShutdownTubeMeanMetalTemperature	Real	Temperature	Assemblies,ShellSide,Shell,NormalDesignCriteria(1),MetalTemperature
StartupShellPressure	Real	Pressure gauge	Assemblies,ShellSide,Shell,NormalDesignCriteria(1),Pressure
StartupTubeMeanMetalTemperature	Real	Temperature	Assemblies,Bundle,TubeType(1),NormalDesignCriteria(1),MetalTemperature
StartupTubePressure	Real	Pressure gauge	Assemblies,Bundle,TubeType(1),NormalDesignCriteria(1),Pressure

FIG. 4Q

StartupTubeSheetMeanMetalTemperature	Real	Temperature	Assemblies,Bundle,TubeSheets(1),NormalDesignCriteria(1),MetalTemperature
Status	String	Status	
SteamOutShellMeanMetalTemperature	Real	Temperature	Assemblies,ShellSide,Shell,NormalDesignCriteria(1),SteamOutTemperature
SteamOutShellIPressure	Real	Pressure gauge	Assemblies,ShellSide,Shell,NormalDesignCriteria(1),SteamOutPressure
SteamOutShellRequirement	Boolean		Assemblies,ShellSide,Shell,NormalDesignCriteria,SteamOutRequirement
SteamOutTemperature	Real	Temperature	Assemblies,ShellSide,Shell,NormalDesignCriteria,SteamOutTemperature
SteamOutTubeMeanMetalTemperature	Real	Temperature	Assemblies,Bundle,TubeType(1),NormalDesignCriteria(1),SteamOutTemperature
SteamOutTubePressure	Real	Pressure gauge	Assemblies,Bundle,TubeType(1),NormalDesignCriteria(1),SteamOutPressure
SteamOutTubeSheetMeanMetalTemperature	Real	Temperature	Assemblies,Bundle,Tubesheets(1),NormalDesignCriteria(1),SteamOutPressure
SurfaceExcessMinimum	Real	Area normal	
SurfacePerShellEffective	Real	Area normal	Assemblies,Bundle,ShellSide,EffectiveArea
SurfacePerUnitEffective	Real	Area	EffectiveSurfacePerUnit
SurfacePerUnitRequired	Real	Area normal	RequiredSurfacePerUnit
TEMAClass	eTemaClass(ShellAndTul		TEMAClass
TEMAOrientation	eTemaOrientation PIP \		TEMAOrientation
TEMARemarks	String		TEMARemarks
TEMASize	String		Status
TEMAType	String	Type	
TemperatureShellDesign	Real	Temperature tmf	NormalDesignCriteria(1),ShellsideDesign, Temperature
TemperatureTubeDesign	Real	Temperature tmf	NormalDesignCriteria(1),ShellsideDesign, Temperature
TemperatureTubeDesign	Real	Temperature tmf	NormalDesignCriteria(1),TubesideDesign, Temperature
TerminalStreams	MaterialFlowSpecification		MaterialPorts(*)PipingSystem
TestRingRequired	Boolean		InspectionAndTests,TestRingRequired
ThicknessShell	Real	Length small	Assemblies,ShellSide,Thickness

FIG. 4R

TotalCost	Real		Currency	CostData.TotalCost
TubeBaffleDiameterClearance	Real		Length normal	Assemblies Bundle, Tube ToBaffleClearance
TubeBWGAverage	Integer			Assemblies Bundle, TubeType(1),BirminghamWireGauge
TubeBWGMinimum	Integer			Assemblies Bundle, TubeType(1),BirminghamWireGaugeMinimum
TubeCorrosionAllowance	Real		Length inches	NormalDesignCriteria(1), TubesideDesign,AllowableCorrosionAllowance
TubeFinDiameterOuter	Real		Length inches	Assemblies Bundle, TubeType(1),Externals,OuterDiameter
TubeFinDiameterRoot	Real		Length normal	Assemblies Bundle, TubeType(1),Externals,RootDiameter
TubeFinHeight	Real		Length normal	Assemblies Bundle, TubeType(1),Externals,Height
TubeFinMaterial	String			Assemblies Bundle, TubeType(1),Externals,MaterialOfConstruction,MaterialName
TubeFinPerUnitLength	Real		Inverse length	Assemblies Bundle, TubeType(1),Externals,NumberOfFinsPerUnitLength
TubeFinPitch	Real		Length normal	Assemblies Bundle, TubeType(1),Externals,FinPitch
TubeFinThickness	Real		Length normal	Assemblies Bundle, TubeType(1),Externals,AverageThickness
TubeInletEndlength	Real		Length normal	Assemblies Bundle, TubeType(1),InletEndlength
TubeInnerDiameter	Real		Length small	Assemblies Bundle, TubeType(1),InnerDiameter
TubeLayout	eTubeLayout(Exchange)			Assemblies Bundle, TubeLayout
TubeLayoutAlternate	eTubeLayout(Exchange)			Assemblies Bundle, TubeLayoutAlternate
TubeLayoutSpec	eTubeLayout(Exchange)			Assemblies Bundle, TubeLayoutSpec
TubeLength	Real		Length	Assemblies Bundle, TubeType(1),TotalLength
TubeLengthIncrement	Real		Length small	NormalDesignCriteria(1), TubesideDesign, TubeLengthIncrement
TubeLengthMaximum	Real		Length small	NormalDesignCriteria(1), TubesideDesign, MaximumTubeLength
TubeLengthMinimum	Real		Length small	NormalDesignCriteria(1), TubesideDesign, MinimumTubeLength
TubeLengthStraight	Real		Length normal	Assemblies Bundle, TubeType(1),StraightLength
TubeLengthUnfirmedABaffles	Real		Length	
TubeMaterial	String			Assemblies Bundle, TubeType(1),MaterialOfConstruction, MaterialName

FIG. 4S

TubeMaterialClass	String			Assemblies, Bundle, TubeType(1), MaterialOfConstruction, MaterialName
TubeMaterialDensity	Real		Density	Assemblies, Bundle, TubeType(1), MaterialOfConstruction, Density
TubeNumber	Integer			Assemblies, Bundle, TotalNumberOfTubes
TubeOuterDiameter	Real		Length	Assemblies, Bundle, TotalType(1), OuterDiameter
TubeOuterDiameterAlternate	Real		Length small	Assemblies, Bundle, TubeType(1), OuterDiameterAlternate
TubeOuterEndlength	Real		Length normal	Assemblies, Bundle, TubeType(1), OuterEndlength
TubePassesIncrement	String			
TubePassesNumberPerShell	Integer			Assemblies, Bundle, NumberTubePassesPerShell
TubePassesNumberPerShellMaximum	Real			
TubePassesNumberPerShellMinimum	Real			
TubePitch	Real		Length	Assemblies, Bundle, TubePitch
TubePitchAlternate	Real		Length normal	Assemblies, Bundle, TubePitchAlternate
TubeCorrosionAllowance	Real		Length small	Assemblies, Bundle, TubeType(1), MaterialOfConstruction, CorrosionAllowance
TubeSheetFloatingMaterial	String			Assemblies, Bundle, Tubesheets(2), MaterialOfConstruction, MaterialName
TubeSheetCorrosionAllowance	Real		Length	Assemblies, Bundle, Tubesheets(1), MaterialOfConstruction, CorrosionAllowance
TubeSheetsMaterial	String			Assemblies, Bundle, Tubesheets(1), MaterialOfConstruction, MaterialName
TubeSheetThickness	Real		Length	Assemblies, Bundle, Tubesheets(1), MaterialOfConstruction, Thickness
TubeSideAverageFilmCoefficient	Real		Heat Transfer Coef	Assemblies, PerformanceCriteria, TubesidePerformance, BulkFilmCoefficient
TubeSideCleaning	String			Assemblies, Bundle, MechanicalCleaning
TubeSideCorrosionAllowance	Real		Length	Assemblies, Bundle, TubeType(1), MaterialOfConstruction, CorrosionAllowance
TubeSideDesignPressure	Real		Pressure abs	Assemblies, Bundle, NormalDesignCriteria(1), Pressure
TubeSideDesignPressureMaximum	Real		Pressure abs	Assemblies, Bundle, MaximumDesignCriteria, Pressure
TubeSideDesignTemperature	Real		Temperature Imp	Assemblies, Bundle, NormalDesignCriteria(1), Temperature
TubeSideDesignTemperatureMaximum	Real		Temperature Imp	Assemblies, Bundle, MaximumDesignCriteria, Temperature

FIG. 4T

TubeSideDrainNozzleNumber	Integer		Assemblies, Bundle, Nozzles[NozzleFunction="Drain"].Number
TubeSideDrainNozzleNumber	Integer		Assemblies, Bundle, Nozzles[NozzleFunction="Drain"].Number
TubeSideDrainNozzleRating	eNozzleRating2_PIP_VEG		Assemblies, Bundle, Nozzles[NozzleFunction="Drain"].Rating
TubeSideDrainNozzleSize	Real	Length	Assemblies, Bundle, Nozzles[NozzleFunction="Drain"].NominalSize
TubeSideFluidName	String		MaterialPorts[PhysicalAllocation="TubeIn"].Flow.Name
TubeSideFoulingCoefficient	Real	Heat Transfer Coef	Assemblies, PerformanceCriteria, TubesidePerformance.FoulingCoefficient
TubeSideFoulingResistance	Real	Thermal Resistance	Assemblies, PerformanceCriteria, TubesidePerformance.FoulingResistance
TubeSideGasketMaintenanceFactor	Real	Pressure abs	Assemblies, Bundle, Gasket, MaintenanceFactor
TubeSideGasketMaterial	String		Assemblies, Bundle, Gasket, BodyMaterial, MaterialName
TubeSideGasketThickness	Real	Length small	Assemblies, Bundle, Gasket, BodyMaterial, Thickness
TubeSideGasketFactor	Real	Pressure abs	Assemblies, Bundle, Gasket, MinimumDesignSealingStress
TubeSideInletNozzleAngularPosition	Real	Plane Angle	
TubeSideInletNozzleDistanceFromTubesheet	Real	Length	
TubeSideInletNozzleInsideDiameter	Real	Length small	Assemblies, Bundle, Nozzles[NozzleFunction="Inlet"].Bore
TubeSideInletNozzleNumber	Integer		Assemblies, Bundle, Nozzles[NozzleFunction="Inlet"].Number
TubeSideInletNozzlePressureDrop	Real	Pressure	
TubeSideInletNozzleRating	eNozzleRating2_PIP_VEG		Assemblies, Bundle, Nozzles[NozzleFunction="Inlet"].Rating
TubeSideInletNozzleRhoV2	Real	Density Velocity Sq	Assemblies, Bundle, Nozzles[NozzleFunction="Intermediate"].RhoV2
TubeSideInletNozzleSize	Real	Length	Assemblies, Bundle, Nozzles[NozzleFunction="Inlet"].NominalSize
TubeSideInletNozzleType	String		Assemblies, Bundle, Nozzles[NozzleFunction="Intermediate"].Type
TubeSideInletNozzleWallThickness	Real	Length	
TubeSideInletPressure	Real	Pressure abs	MaterialPorts[PhysicalAllocation="TubeIn"].Flow.BulkFlow Pressure
TubeSideInletTemperature	Real	Temperature Imp	MaterialPorts[PhysicalAllocation="TubeIn"].Flow.BulkFlow Temperature
TubeSideIntermediateNozzleNumber	Integer		Assemblies, Bundle, Nozzles[NozzleFunction="Intermediate"].Number

FIG. 4U

TubeSideIntermediateNozzleRating	eNozzleRating2_PIP_VEC	Assemblies,Bundle,Nozzles[NozzleFunction="Intermediate"].Rating
TubeSideIntermediateNozzleRhoV2	Real	Assemblies,Bundle,Nozzles[NozzleFunction="Intermediate"].RhoV2
TubeSideIntermediateNozzleSize	Real	Assemblies,Bundle,Nozzles[NozzleFunction="Intermediate"].NominalSize
TubeSideIntermediateNozzleType	String	Assemblies,Bundle,Nozzles[NozzleFunction="Intermediate"].Type
TubeSideLatentHeat	Real	MaterialPorts[PhysicalAllocation="TubeIn"].Flow,BulkFlow,ThermodynamicProperties.HeatOfVaporization
TubeSideLatentHeatReferenceTemperature	Real	MaterialPorts[PhysicalAllocation="TubeIn"].Flow,BulkFlow,TransportProperties.ReferenceTemperature
TubeSideLiquidInletDensity	Real	MaterialPorts[PhysicalAllocation="TubeIn"].Flow,Liquid1Phase,PvtProperties.DensityMassBasis
TubeSideLiquidInletFlow	Real	MaterialPorts[PhysicalAllocation="TubeIn"].Flow,Liquid1Phase,MassFlowRate
TubeSideLiquidInletSpecificHeat	Real	MaterialPorts[PhysicalAllocation="TubeIn"].Flow,Liquid1Phase,ThermodynamicProperties.HeatCapacity
TubeSideLiquidInletSurfaceTension	Real	Surface.Tension
TubeSideLiquidInletThermalConductivity	Real	MaterialPorts[PhysicalAllocation="TubeIn"].Flow,Liquid1Phase,TransportProperties.ThermalConductivity
TubeSideLiquidInletViscosity	Real	MaterialPorts[PhysicalAllocation="TubeIn"].Flow,Liquid1Phase,TransportProperties.Viscosity
TubeSideLiquidOutletDensity	Real	MaterialPorts[PhysicalAllocation="TubeOut"].Flow,Liquid1Phase,PvtProperties.DensityMassBasis
TubeSideLiquidOutletFlow	Real	MaterialPorts[PhysicalAllocation="TubeOut"].Flow,Liquid1Phase,MassFlowRate
TubeSideLiquidOutletNozzleInsideDiameter	Real	Assemblies,Bundle,Nozzles[NozzleFunction="LiquidOutlet"].Bore
TubeSideLiquidOutletNozzleNumber	Integer	Assemblies,Bundle,Nozzles[NozzleFunction="LiquidOutlet"].Number
TubeSideLiquidOutletNozzleRating	eNozzleRating2_PIP_VEC	Assemblies,Bundle,Nozzles[NozzleFunction="LiquidOutlet"].Rating
TubeSideLiquidOutletNozzleRhoV2	Real	Assemblies,Bundle,Nozzles[NozzleFunction="LiquidOutlet"].RhoV2
TubeSideLiquidOutletNozzleSize	Real	Assemblies,Bundle,Nozzles[NozzleFunction="LiquidOutlet"].NominalSize
TubeSideLiquidOutletNozzleType	String	Assemblies,Bundle,Nozzles[NozzleFunction="LiquidOutlet"].Type
TubeSideLiquidOutletSpecificHeat	Real	MaterialPorts[PhysicalAllocation="TubeOut"].Flow,Liquid1Phase,ThermodynamicProperties.HeatOfVaporization
TubeSideLiquidOutletThermalConductivity	Real	MaterialPorts[PhysicalAllocation="TubeOut"].Flow,Liquid1Phase,TransportProperties.ThermalConductivity
TubeSideLiquidOutletViscosity	Real	MaterialPorts[PhysicalAllocation="TubeOut"].Flow,Liquid1Phase,TransportProperties.Viscosity
TubeSideMinimumDesignMetalTemperature	Real	MinimumDesignCriteria(1).MetalTemperature

FIG. 4V

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TubeSideNoncondensableInletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="TubeIn",Flow,NonCondensibles,MassFlowRate
TubeSideNoncondensableInletMw	Real	Molar Mass	MaterialPorts[PhysicalAllocation="TubeIn",Flow,NonCondensibles,MolecularWeight
TubeSideNoncondensableOutletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="TubeOut",Flow,NonCondensibles,MassFlowRate
TubeSideNoncondensableOutletMw	Real	Molar Mass	MaterialPorts[PhysicalAllocation="TubeOut",Flow,NonCondensibles,MolecularWeight
TubeSideOutletNozzleInsideDiameter	Real	Length	Assemblies,Bundle,Nozzles[NozzleFunction="Outlet",Bore
TubeSideOutletNozzleNumber	Integer	Quantity Type	Assemblies,Bundle,Nozzles[NozzleFunction="Outlet",Number
TubeSideOutletNozzleNumber	Integer		Assemblies,Bundle,Nozzles[NozzleFunction="Outlet",Number
TubeSideOutletNozzleRating	eNozzleRating2, PIP VEC		Assemblies,Bundle,Nozzles[NozzleFunction="Outlet",Rating
TubeSideOutletNozzleRhoV2	Real	Density Velocity Sq	Assemblies,Bundle,Nozzles[NozzleFunction="Outlet",Rho2
TubeSideOutletNozzleSize	Real	Length	Assemblies,Bundle,Nozzles[NozzleFunction="Outlet",NominalSize
TubeSideOutletNozzleType	String		Assemblies,Bundle,Nozzles[NozzleFunction="Outlet",Type
TubeSideOutletSurfaceTension	Real	Surface Tension	
TubeSideOutletTemperature	Real	Temperature tmp	MaterialPorts[PhysicalAllocation="TubeOut",Flow,BulkFlow,Temperture
TubeSidePassesMaximum	Real		
TubeSidePassesMinimum	Real		
TubeSidePassesNumberPerShell	Integer		NumberTubePasses
TubeSidePressureDropAllowable	Real	Pressure Diff	Assemblies,Bundle,NormalDesignCriteria,PressureDrop
TubeSidePressureDropCalculated	Real	Pressure Diff	Assemblies,Bundle,NormalOperatingCriteria,PressureDrop
TubeSideSteamInletFlow	Real	Flow Rate(Mass)	MaterialPorts[PhysicalAllocation="TubeIn",Flow,Steam,MassFlowRate
TubeSideSteamOutletFlow	Real	Flow Rate(Mass)	MaterialPorts[PhysicalAllocation="TubeOut",Flow,Steam,MassFlowRate
TubeSideTestPressure	Real	Pressure abs	Assemblies,Bundle,InspectionAndTests,HydrostaticTestPressure
TubeSideTotalFluidQuantity	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="TubeIn",Flow,BulkFlow,MassFlowRate
TubeSideVaporInletDensity	Real	Density	MaterialPorts[PhysicalAllocation="TubeIn",Flow,VapourPhase,PvtProperties,DensityMassBasis
TubeSideVaporInletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="TubeIn",Flow,VapourPhase,MassFlowRate

FIG. 4W

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TubeSideVaporInletFlow	Real	Molar Mass	MaterialPorts[PhysicalAllocation="TubeIn"].Flow.VapourPhase.MolecularWeight
TubeSideVaporInletSpecificHeat	Real	Spec Heat Cap[Ma	MaterialPorts[PhysicalAllocation="TubeIn"].Flow.VapourPhase.ThermodynamicProperties.HeatCa
TubeSideVaporInletThermalConductivity	Real	Thermal Conductivi	MaterialPorts[PhysicalAllocation="TubeIn"].Flow.VapourPhase.TransportProperties.ThermalConc
TubeSideVaporInletViscosity	Real	Dynamic Viscosity	MaterialPorts[PhysicalAllocation="TubeIn"].Flow.VapourPhase.TransportProperties.Viscosity
TubeSideVaporOutletDensity	Real	Density	MaterialPorts[PhysicalAllocation="TubeOut"].Flow.VapourPhase.PvtProperties.DensityMassBasis
TubeSideVaporOutletFlow	Real	Flow Rate (Mass)	MaterialPorts[PhysicalAllocation="TubeOut"].Flow.VapourPhase.MassFlowRate
TubeSideVaporOutletMw	Real	Molar Mass	MaterialPorts[PhysicalAllocation="TubeOut"].Flow.VapourPhase.MolecularWeight
TubeSideVaporOutletNozzleRhoV2	Real	Density Velocity Sq	Assemblies.Bundle.Nozzles[NozzleFunction="VaporOutlet"].RhoV2
TubeSideVaporOutletNozzleSize	Real	Length small	Assemblies.Bundle.Nozzles[NozzleFunction="VaporOutlet"].NominalSize
TubeSideVaporOutletNozzleType	String		Assemblies.Bundle.Nozzles[NozzleFunction="VaporOutlet"].Type
TubeSideVaporOutletSpecificHeat	Real	Spec Heat Cap[Ma	MaterialPorts[PhysicalAllocation="TubeOut"].Flow.VapourPhase.ThermodynamicProperties.HeatC
TubeSideVaporOutletThermalConductivity	Real	Thermal Conductivi	MaterialPorts[PhysicalAllocation="TubeOut"].Flow.VapourPhase.TransportProperties.ThermalCon
TubeSideVaporOutletViscosity	Real	Dynamic Viscosity	MaterialPorts[PhysicalAllocation="TubeOut"].Flow.VapourPhase.TransportProperties.Viscosity
TubeSideVelocity	Real	Velocity	Assemblies.PerformanceCriteria.TubesidePerformance.MidpointVelocity
TubeSideVentNozzleNumber	Integer		Assemblies.Bundle.Nozzles[NozzleFunction="Vent"].Number
TubeSideVentNozzleRating	eNozzleRating2_PIP_VEC		Assemblies.Bundle.Nozzles[NozzleFunction="Vent"].Rating
TubeSideVentNozzleSize	Real	Length	Assemblies.Bundle.Nozzles[NozzleFunction="Vent"].NominalSize
TubeSideWaterInletFlow	Real	Flow Rate(Mass)	MaterialPorts[PhysicalAllocation="TubeIn"].Flow.CoolingWater.MassFlowRate
TubeSideWaterOutletFlow	Real	Flow Rate(Mass)	MaterialPorts[PhysicalAllocation="TubeOut"].Flow.CoolingWater.MassFlowRate
TubesInWindowNumberOf	Real		
TubeSlope	Real	Plane Angle	Assemblies.Bundle.Slope
TubeSupport	String		Assemblies.Bundle.BundleSupport.Type
TubeThermalConductivity	Real	Thermal Conductivi	Assemblies.Bundle.TubeType(1).MaterialOfConstruction.ThermalConductivity
TubeThickness	Real	Length	Assemblies.Bundle.TubeType(1).WallThickness

FIG. 4X

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Tube ThicknessAlternate	Real	Length small	Assemblies.Bundle.Tube Type(1).Wall ThicknessAlternate
Tube ThicknessUnderFins	Real	Length small	
Tube To Tubesheet Joint	eTube To Tubesheet Joint		Assemblies.Bundle.Tubesheets(1).Tube To Tubesheet Joint
Tube Type	eType(ExchangerTube)		Assemblies.Bundle.Tube Type(1).Tube Type
Tube Young Modulus	Real	Stress	Assemblies.Bundle.Tube Type(1).Material Of Construction.Elastic Modulus
UBend Radius	Real	Length small	
UBendSupportDescription	String		Assemblies.Bundle.UBendSupport.Description
UBendSupportType	eType(UBendSupport)		Assemblies.Bundle.UBendSupport.Support Type
Upset1ShellMeanMetalTemperature	Real	Temperature	Assemblies.ShellSide.Shell.NormalDesignCritical(1).Metal Temperature
Upset1ShellPressure	Real	Pressure gauge	Assemblies.ShellSide.Shell.NormalDesignCritical(1).Pressure
Upset1TubeMeanMetalTemperature	Real	Temperature	Assemblies.Bundle.Tube Type(1).NormalDesignCritical(1).Metal Temperature

FIG. 4Y

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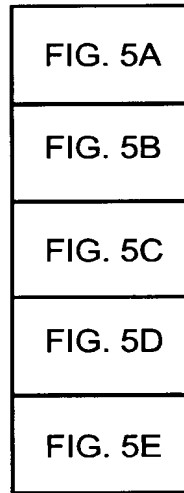


FIG. 5

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Class View 'PIP VED5T00s'					
	Name	Type	Quantity Type	Link	39
	DatasheetObjectHeader	DatasheetObject			
	Page1				
	HeaderData				
	PerformanceOfOneUnit				
	ShellSide				
	A FluidName	String		ShellAndTubeExchanger,ShellSideFluidName	
	A TotalfluidQuantity	Real	FlowRate(kg/h)	ShellAndTubeExchanger,ShellSideTotalFluidQuantity	
	FlowRate				
	MolecularWeight				
	A InletTemperature	Real	Temperature(C)	ShellAndTubeHeatExchanger,ShellSideInletTemperature	
	A OutletTemperature	Real	Temperature(C)	ShellAndTubeHeatExchanger,ShellSideOutletTemperature	
	Density				
	Viscosity				
	SpecificHeat				
	ThermalConductivity				
	A LatentHeat	Real	Calorific Val(kJ/kg)	ShellAndTubeHeatExchanger,ShellSideLatentHeat	
	A LatentHeatReferenceTemperature	Real	Temperature(C)	ShellAndTubeHeatExchanger,ShellSideLatentHeatReferenceTemperature	
	A InletPressure	Real	Pressure Absolute	ShellAndTubeHeatExchanger,ShellSideInletPressure	
	A Velocity	Real	Velocity (m/s)	ShellAndTubeHeatExchanger,ShellSideVelocity	
	A AllowablePressureDrop	Real	Pressure Diff (Mpa)	ShellAndTubeHeatExchanger,ShellSidePressureDropAllowable	
	A CalculatedPressureDrop	Real	Pressure Diff (Mpa)	ShellAndTubeHeatExchanger,ShellSidePressureDropCalculated	

FIG. 5A

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Class View 'HetranExchangerInput'				
Name	Type	Quantity Type	Link	35
A DBNAME	String		ShellAndTubeHeatExchanger,ItemNumber	
A INDEX	String		ShellAndTubeHeatExchanger,ItemNumber	
[-N] ProblemDefinition				
[-N] A DBNAME	String		ShellAndTubeHeatExchanger,ItemNumber	
[-N] Description				
[-N] ApplicationOptions				
[-N] ProcessData				
[-N] A DBNAME	String		ShellAndTubeHeatExchanger,ItemNumber	
[-N] ProcessDataTab				
[-N] HeatLoadBalanceOptions				
[-N] PhysicalPropertyData				
[-N] ExchangerGeometry				
[-N] A DBNAME	String		ShellAndTubeHeatExchanger,ItemNumber	
[-N] Exchanger				
[-N] Tubes				
[-N] Bundle				
[-N] A DBNAME	String		ShellAndTubeHeatExchanger,ItemNumber	
[-N] ShellInletOutlet				
[-N] Impingement				
[-N] IMPROTOTYPE	eHetranImpProtType		ShellAndTubeHeatExchanger,ImpingementProtectionType	
[-N] LayoutOptions				
[-N] LayoutLimits				
[-N] Clearances				
[-N] Baffles				

FIG. 5C

<input type="checkbox"/> A DBNAME	String		ShellAndTubeHeatExchanger,ItemNumber
<input type="checkbox"/> BafflesTab			
<input type="checkbox"/> A BAFType	eHeiranBafType		
<input type="checkbox"/> A BAFOUTPERC	Real	Percentage PQT	ShellAndTubeHeatExchanger, BaffleCut
<input type="checkbox"/> A BAFORIE	String		ShellAndTubeHeatExchanger, BaffleCutOrientation
<input type="checkbox"/> TubeSupports			
<input type="checkbox"/> RatingSimulationData			
<input type="checkbox"/> A DBNAME	String		ShellAndTubeHeatExchanger,ItemNumber
<input type="checkbox"/> RatingSimulationGeometry			
<input type="checkbox"/> A SHLID	Real	Length small	ShellAndTubeHeatExchanger, ShellDiameterInner
<input type="checkbox"/> A SHLOD	Real	Length small	ShellAndTubeHeatExchanger, ShellDiameterOuter
<input type="checkbox"/> A BAFSPCCC	Real	Length small	ShellAndTubeHeatExchanger, BaffleSpacing
<input type="checkbox"/> A BAFSPCIN	Real	Length small	ShellAndTubeHeatExchanger, BaffleSpacingFromInlet
<input type="checkbox"/> A BAFSPCOUT	Real	Length small	ShellAndTubeHeatExchanger, BaffleSpacingFromOutlet
<input type="checkbox"/> A BAFNUM	Integer		ShellAndTubeHeatExchanger, BafflesNumber
<input type="checkbox"/> A TUBELNG	Real	Length small	ShellAndTubeHeatExchanger, TubeLengthStraight
<input type="checkbox"/> A TUBENUM	Integer		ShellAndTubeHeatExchanger, TubeNumber
<input type="checkbox"/> A TUBEPASSNUM	Integer		ShellAndTubeHeatExchanger, TubePassesNumberPerShell
<input type="checkbox"/> A SHLSERNUM	Integer		ShellAndTubeHeatExchanger, ShellsInSeriesNumber
<input type="checkbox"/> A SHLPARNUM	Integer		ShellAndTubeHeatExchanger, ShellsInParallelNumber
<input type="checkbox"/> KettleVapourBelt			
<input type="checkbox"/> A KETLOD	Real	Length small	ShellAndTubeHeatExchanger, KettleDiameterOuter
<input type="checkbox"/> A KETLID	Real	Length small	ShellAndTubeHeatExchanger, KettleDiameterInner
<input type="checkbox"/> A VAPBLTOD	Real	Length small	ShellAndTubeHeatExchanger, VaporBeltDiameterOuter
<input type="checkbox"/> A VAPBLTID	Real	Length small	ShellAndTubeHeatExchanger, VaporBeltDiameterInner

FIG. 5D

FIG. 5E

FIG. 5E

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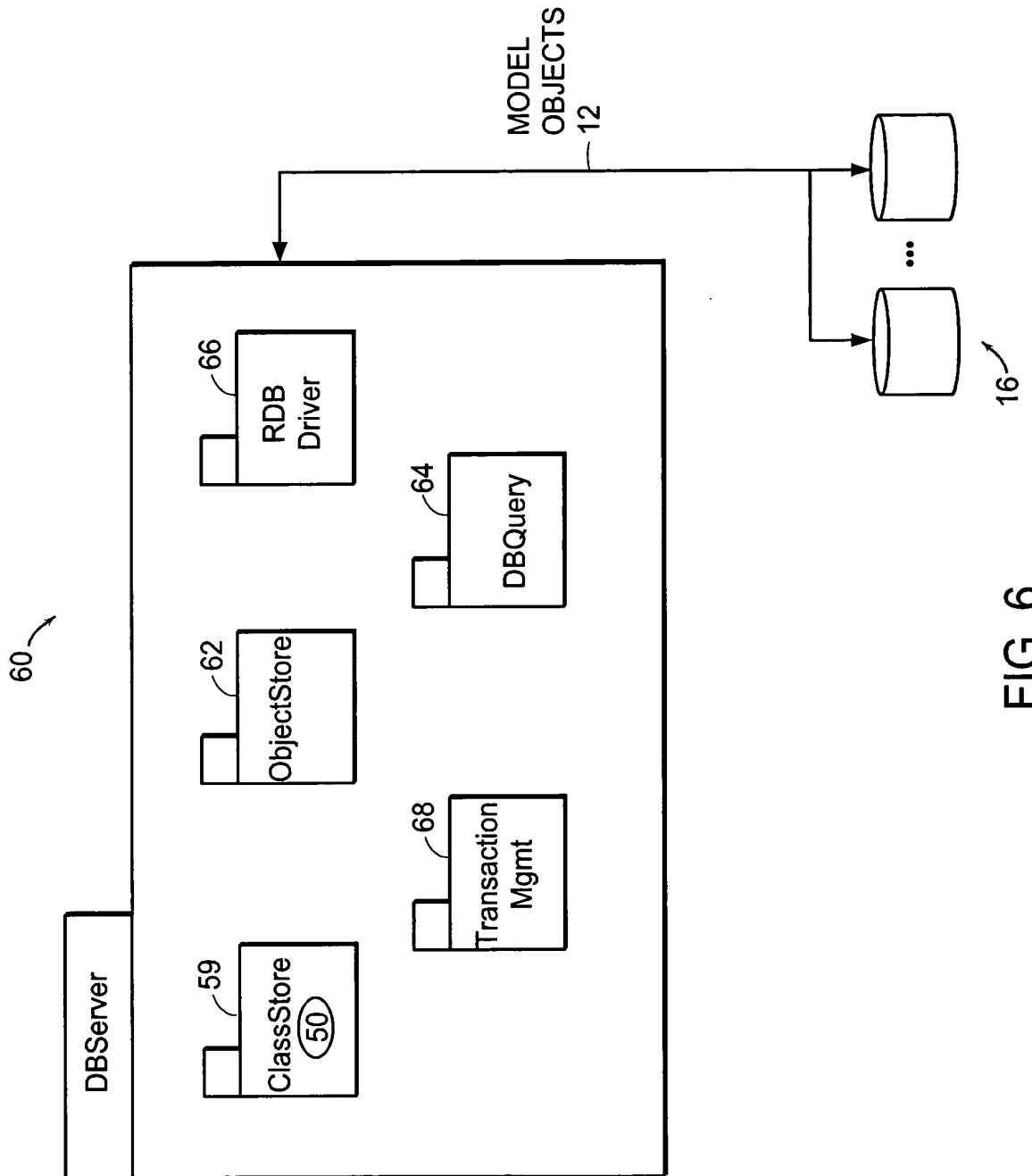


FIG. 6

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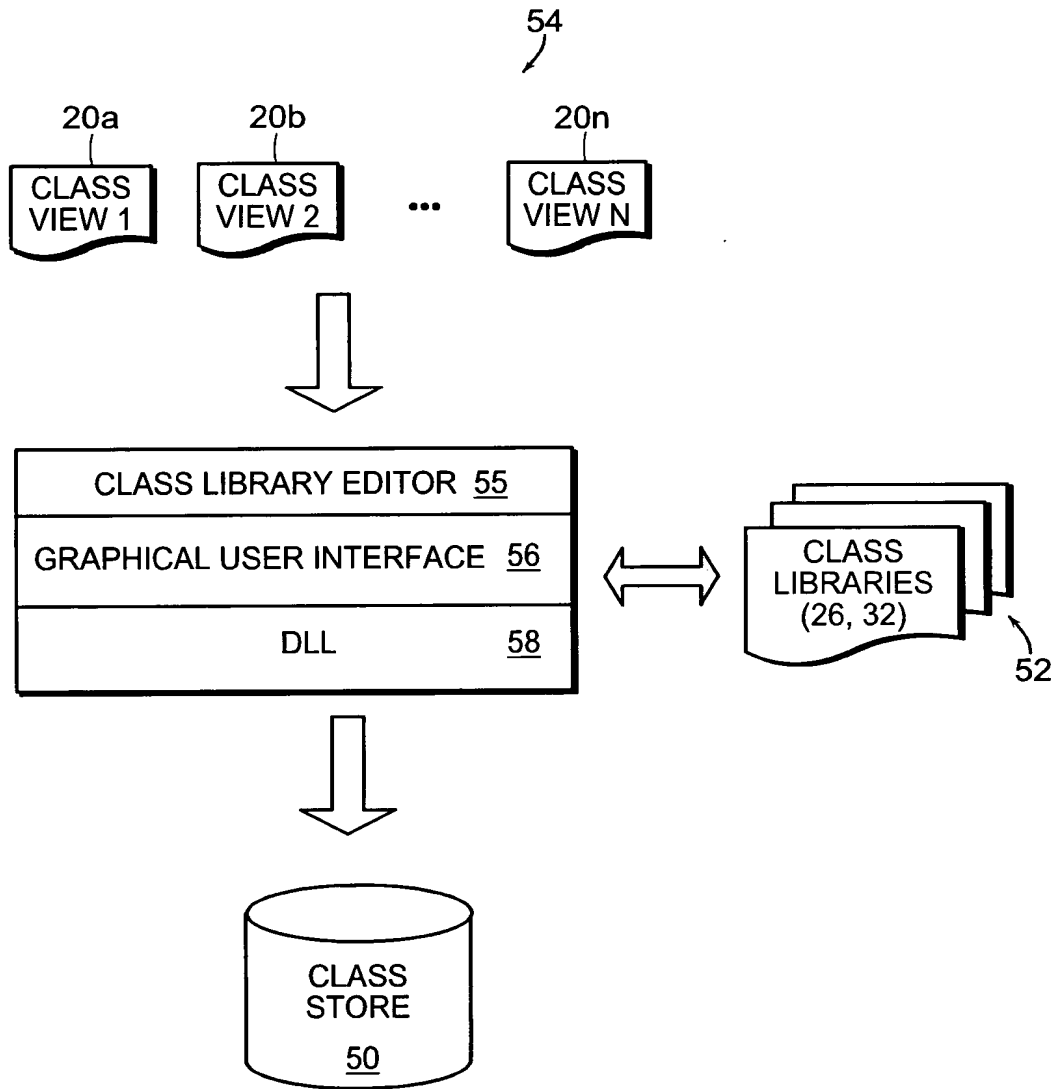


FIG. 7

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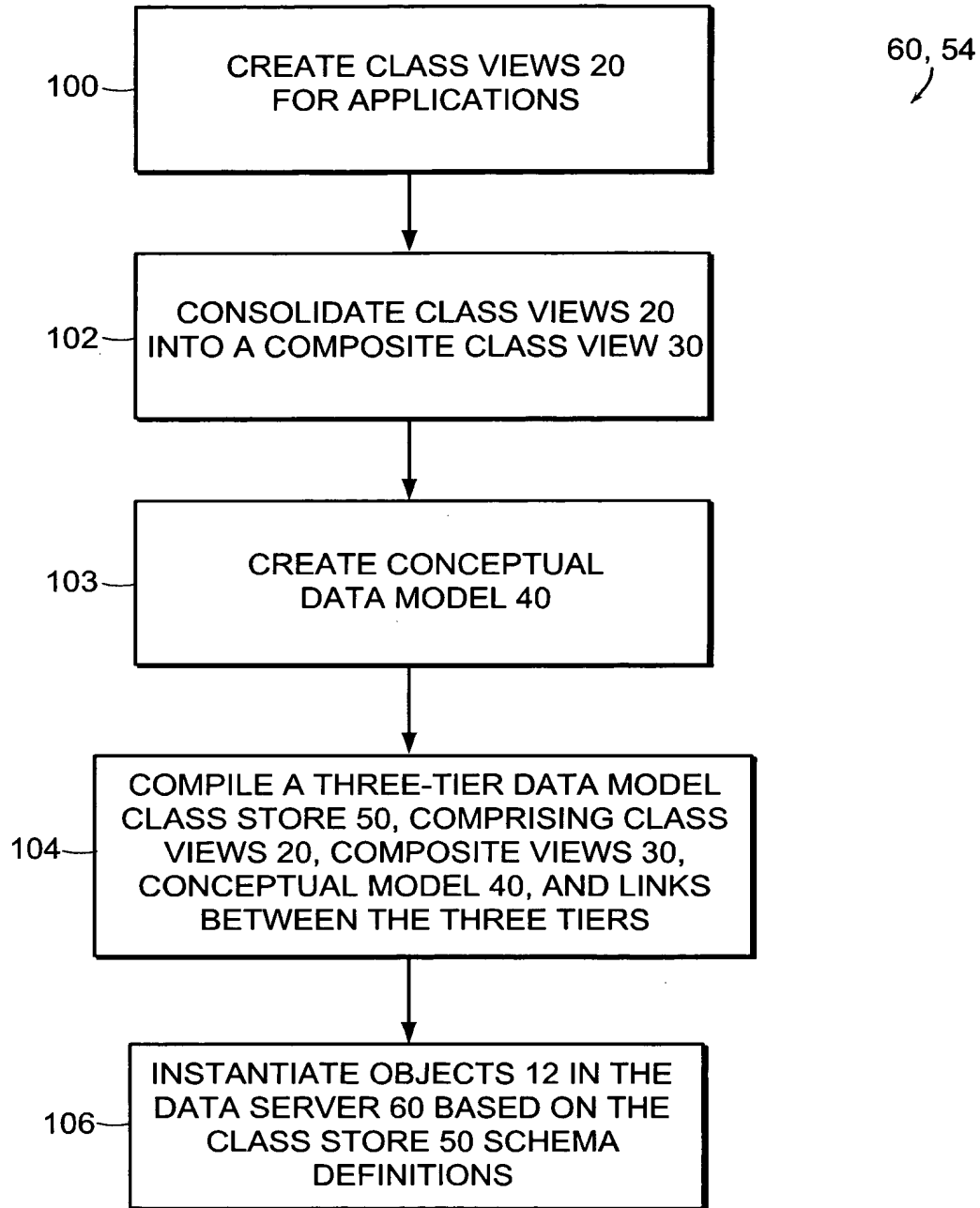


FIG. 8